N* NABERS

The Rules

Energy for Data centres

Version 2.0 — April 2024

Cover photo: Network and internet communication technology concept, data centre interior.

Contents

1 Introduction

1.1 General

1.1.1 About NABERS

The National Australian Built Environment Rating System (NABERS) is a performance-based rating system managed by the **National Administrator**.

NABERS ratings are expressed as a number of stars, as follows:

NABERS rating	Performance comparison
6 stars ★★★★★	Market leading building performance
5 stars ★★★★★	Excellent building performance
3 stars ★★★	Market average building performance

An accredited NABERS energy rating is awarded when the **National Administrator** certifies a rating completed by an **Assessor**. The **National Administrator** may independently audit the rating and assist in resolving complex technical issues.

1.1.2 About this document

This document contains **Rules** for **Assessors** conducting an energy rating for **data centres** as follows:

a) Processing capacity, see Chapter 4.

b) Storage capacity, see Chapter 5.

c) Energy coverage, see Chapter 6.

d) Consumption data, see Chapter 7.

e) Metering systems, see Chapter 8.

These **Rules** will supersede *NABERS Energy for data centres — Rules for collecting and using data*, v1.1, 2014.

1.1.3 Scope for NABERS energy for data centre ratings

Under the NABERS rating system, the number of stars awarded to a **data centre** is calculated by benchmarking the site's actual energy consumption and comparing it against buildings of the same category. Key factors that influence this consumption are taken into account depending on the rating scope.

The rating scope is determined as shown in Table 1.1.3:

Table 1.1.3: Rating scopes for NABERS energy for data centres

Type of rating	Scope
Infrastructure	This rating measures and benchmarks the greenhouse gas emissions associated with the energy consumed in supplying **infrastructure services** to the **IT equipment** within a **data centre** as follows: a) Air-conditioning. b) Lighting. c) Power distribution. d) Back-up for the **data centre**, including generator fuel for backup and security within the **data centre**.
IT equipment	This rating measures and benchmarks the greenhouse gas emissions associated with the electricity consumed by the **data centre IT equipment**, including computer servers, storage, network, and other **IT equipment** within the **data centre**.
Whole facility	This rating measures and benchmarks the greenhouse gas emissions associated with energy used by both the **IT equipment** and **infrastructure services** in a **data centre**.

1.2 Interpretation of the Rules and Rulings

These **Rules** are to be read in conjunction with the respective NABERS **Rulings** as they apply to the specific building type. **Rulings** are used to address specific issues that may arise after the publication of the **Rules**.

Note: Rules texts are amended as required by additional **Rulings** which are published on the NABERS website at www.nabers.gov.au.

Where a conflict between these **Rules** and existing **Rulings** is present, the requirements of the **Rulings** take precedence over the **Rules**.

1.3 Situations not covered by the Rules

Assessors must comply with these **Rules** unless prior approval has been sought and approved by the **National Administrator**.

Where appropriate, **Assessors** may contact the **National Administrator** to propose an alternative methodology, outlining the circumstances and rationale. Prior approval for use is required and may be granted conditionally, on a case-by-case basis and at the **National Administrator's** discretion.

Procedures not contained within these **Rules** may only be used for a particular rating with prior written approval from the **National Administrator**. Approval to use the same procedure must be sought from the **National Administrator** each time it is proposed to be used. Approval is entirely at the discretion of the **National Administrator**.

1.4   How to use this document

The term "**Rules**" refers to a body of works produced by NABERS that specify what must be examined, tested and documented when an **Assessor** conducts a rating. Wherever the term is used in this document from Chapter 3 onwards, it refers to this document, *NABERS Ruling — Energy for data centres.* Other **Rules** documents mentioned in the text are distinguished from the present document by the inclusion of their title.

Text appearing **dark green** and **bold** is a defined term. Defined terms can be found in Chapter 2 of these **Rules** or in the terms and definitions chapter of the respective **Rules** document.

The following formatting conventions may appear in this text:

⚠ Important requirements and/or instructions are highlighted by an information callout box.

Note: Text appearing with a grey background is explanatory text only and is not to be read as part of the **Rules**.

Example: Text appearing with a green background is intended to demonstrate a worked example of the respective **Rules** section or **Ruling** section.

📋 This is a documentation requirement callout box.

1.5   What is new in this version

A list of the main changes made between this version and the previous version, is given in Appendix E.

1.6   Related documents

The following documents have been referenced within these **Rules**:

NABERS Ruling — Shared Services and Facilities, v1.0, 2022

NABERS The Interim Rules — Thermal Energy Systems, v1.0, 2021

NABERS The Rules — Metering and Consumption, v2.1, 2023

Recommendations for Measuring and Reporting Overall Data Center Efficiency, *Version 2 — Measuring PUE for Data Centers*, 17 May 2011

2 Terms and definitions

This chapter lists the key terms and their definitions that are integral to the proper use of this document.

Term	Definition
acceptable data	Data which meets the applicable accuracy and validity requirements of these Rules.
acceptable estimate(s)	The values derived from an estimation method permitted by these Rules in place of incomplete or uncertain data. Estimates that do not satisfy the above specifications are deemed unacceptable and cannot be used in the rating.
alternative method	A method for obtaining or interpreting data for an assessment which is not the preferred method, but which has been approved by the National Administrator as one of the following: a) Equivalent to the preferred method in terms of its results, accuracy and validity. b) Acceptable in place of the preferred method, subject to the data resulting from the alternative method being treated as an estimate in accordance with Section 3.4 Standards for acceptable data and estimates, or other specified conditions on the use of the data.
Assessor(s)	An accredited person authorised by the National Administrator to conduct NABERS ratings.
Auditor(s)	A person employed by or contracted to the National Administrator to perform audits of NABERS rating applications.
capacity variable	Procedures that are generic to either processing capacity or storage capacity.
clock speed(s)	The speed of the processor measured in GHz (10^9 cycles/s).
core(s)	The physical core that is an embedded constituent of a processor. **Note:** This definition does not include logical cores.
data	Information which depends for its accuracy on one of the following: a) Measurements to a known standard of accuracy. b) Verified specifications with a given tolerance for accuracy.

Term	Definition
	c) Other objective evidence.
data centre(s)	A facility that is dedicated to the housing and operation of IT equipment. It may be a standalone facility or a facility within a building that also includes other facilities such as offices.
	Note: For the purposes of this rating, the data centre includes all services and equipment directly located in or servicing the IT equipment area (typically defined by a closed off area with dedicated space temperature control) and does not include facilities serving other areas such as supporting office space.
end use(s)	A purpose or activity (or a group of related purposes and activities) that energy is used for.
	Where several instances of very similar individual end uses occur together so as to form a single collection (for example, luminaires in a lighting grid, or racks in a data centre) then the collection is to be regarded as a single end use.
estimate(s)/(ed)	Information relying on an Assessor's subjective judgement of the values to be used in place of incomplete or uncertain data.
heating, ventilation and air-conditioning (HVAC)	Any system that is used for heating, ventilating or conditioning the air in an enclosed space.
information technology (IT) equipment	This equipment includes the following: a) Computer servers. b) Storage equipment. c) Network equipment, excluding PoE equipment. d) Other information technology equipment within the data centre.
	Note: Any equipment covered under the definition of infrastructure services is not considered IT equipment.
information technology (IT) equipment energy consumption measurement period	The period of time (i.e. 28 to 40 days) when weekly energy consumption data is collected from all meters supplying energy to the IT equipment for a minimum of two (2) weeks before and after the site visit to validate the processing and storage devices.
information technology (IT) equipment rating	The assessment of greenhouse gas emissions associated with the energy consumed by the data centre IT equipment during the rating period, including the following: a) Computer servers.

Term	Definition
	b) Storage equipment.
	c) Network equipment.
	d) Other information technology equipment within the data centre.
	Note: An IT equipment rating does not include the infrastructure services covered under an Infrastructure rating.
infrastructure rating(s)	The assessment of greenhouse gas emissions associated with the energy consumed in supplying infrastructure services to IT equipment within a data centre during the rating period, using the Power Usage Effectiveness (PUE) calculation. This is done by measuring the IT equipment electricity consumption and the infrastructure services energy consumption.
infrastructure service(s)	Services that support the activity of the data centre, including the following: a) Air-conditioning to the data centre. b) Lighting to the data centre. c) Power conditioning and back-up for the data centre, including generator fuel and UPS. d) Power distribution including Power Distribution Units (PDUs). e) Security services for the data centre.

metering system(s)	A system of one or more devices providing an individual measurement.
	
	 A metering system for an individual measurement includes the following:
	
	 a) The meter.
	
	 b) The processes that convert the initial meter signal into an energy reading, e.g. current transformers and k factors for electricity meters, pressure correction factors for gas meters.
	
	 c) The interface through which the meter reading is taken, e.g. one of the following:
	
	    1) Manual readings.
	
	    2) Utility software.
	
	    3) Building Management System.
	
	    4) Meter web interface.
	
	    5) Simple Network Management Protocol (SNMP) monitoring system.

Term	Definition
	Note: Assessors will ensure that the accuracy of each overall metering system is within the allowable accuracy limits.
	The most common errors with metering systems occur with —
	i) manual misreading;
	ii) incorrect conversion factors; and
	iii) failures between the meter and meter reading system.
NABERS Perform	A software tool administered by the National Administrator that is used by the Assessor for entering assessment data and performing some processing and analyses.
NABERS rating input form	The rating input form provided by the National Administrator for use by Assessors in the calculation of accredited ratings.
nameplate	The maximum possible power consumption of the IT equipment, usually displayed as a sticker affixed to the exterior of the piece of IT equipment.
	The nameplate shows the maximum possible power draw of the IT equipment. Actual power consumption is typically much less than the nameplate power as the power supply is always oversized and/or under-utilised for reliability purposes.
National Administrator	The body responsible for administering NABERS, in particular the following areas:
	a) Establishing and maintaining the standards and procedures to be followed in all aspects of the operation of the system.
	b) Determining issues that arise during the operation of the system and the making of ratings.
	c) Accrediting Assessors and awarding accredited ratings in accordance with NABERS standards and procedures.
	The functions of the National Administrator are undertaken by the NSW Government.
non-utility meter(s)	A meter measuring distribution of energy in a building which is not operated by a utility supplier.
non-utility metering system(s)	An energy metering system that is owned or operated by a third party other than a utility.
potential error(s)	The total of acceptable estimates (including assumptions, approximations, and unverified data) included in the rating assessment.

Term	Definition
	Note: NABERS Perform automatically calculates the potential error based on the data provided.
Power Distribution Unit(s) (PDU(s))	An electrical distribution board located between the Uninterrupted Power Supply (UPS) and the IT equipment, containing circuit breakers for electrical circuits supplying IT equipment.
Power over Ethernet (PoE)	A system to pass electrical power safely, along with data, on ethernet cabling.
	Note: Energy consumption from PoE equipment is excluded from the NABERS energy for data centre rating tools.
processing capacity	The total processing capacity (measured in gigahertz (GHz)) is the sum of the server clock speed (in GHz) multiplied by the number of cores for all qualifying servers. One GHz is equal to 10^9 Hz.
qualifying server(s)	All servers that are as follows: a) Located within the data centre facility. b) Downstream of the energy metering point(s) being used for the NABERS IT equipment or whole facility rating. c) Contribute to the processing capacity of the facility. d) Not decommissioned or switched off.
qualifying storage devices	All storage devices that are as follows: a) Located within the data centre facility. b) Downstream of the energy metering point(s) being used for the NABERS IT equipment or whole facility rating. c) Not decommissioned or switched off.
rating period	*For NABERS data centre IT equipment ratings*: The 28 to 40 days period (approximately one month) of the rating, requiring 28 to 40 days of continuous acceptable data, upon which the rating is based. *For NABERS data centre infrastructure and whole facility ratings*: The 12-month period for the rating, requiring at least 12 continuous months of acceptable data, upon which the rating is based.
	Note: Some allowances and adjustments are possible for data that do not exactly coincide with the rating period for infrastructure and whole facility ratings. See *NABERS The Rules — Metering and Consumption* for further detail.

Term	Definition
Remote Meter Reading System (RMRS)	A system whereby meter readings and other crucial meter data are sent to a data collection system. Such a system provides virtual meter access when physical access is not possible.
Rules	Authoritative document produced by the National Administrator that specifies what must be covered by an Assessor in order to produce a rating.
Ruling(s)	An authoritative decision by the National Administrator which acts as an addition or amendment to the Rules.
server(s)	Computers and/or devices used to store, process and output information over a network.
storage device(s)	Devices used in the storage of digital information on any type of media, e.g. hard disk and optical.
source(s)	An individual fuel or energy source type, such as gas, electricity or diesel fuel.
storage capacity	The total unformatted storage capacity (measured in terabytes (TB)) is calculated by multiplying the number of disks/tapes by the storage (TB) for each qualifying storage device. One TB is equal to 1012 bytes.
tape(s)	A type of storage media utilising magnetic tape for the storage of digital data.
unformatted storage	Storage media that have not been electronically prepared to store information, e.g. storage media without a file system.
Uninterrupted Power Supply (UPS)	A device that provides battery backup when the electrical power fails or drops to an unacceptable voltage level.
utility	An organisation or company that holds a licence to retail electricity or gas, and that sells energy as its primary business. This excludes: a) Landlords who on-sell electricity where they neither hold a licence nor have an exemption deemed valid by the National Administrator for needing a licence. b) Third-party contractors, such as meter reading providers.
utility meter	A meter measuring supplies of energy to a building. This meter is operated by a utility supplier as the basis for billing its customer.
utility metering system(s)	An energy metering system that is owned and operated by a utility.

Term	Definition
validation	The process of checking the configuration of a metering system for a NABERS rating, and if necessary, adjusting and re-checking, to ensure the configuration is correct.
validity period	The post-certification period during which the rating is valid for up to 12 months.
verification	Confirmation by examination and objective evidence that specified requirements have been met (usually, that data is accurate and correct), for example, by one of the following:
	a) Comparison of independent measurements or observations, or of measurements and specifications.
	b) Logical or statistical analysis of data for consistency with known requirements.
whole facility rating(s)	The assessment of greenhouse gas emissions associated with the energy used by the IT equipment and infrastructure services within a data centre during the rating period.
	Note: This rating should include all energy supplied for the operation of the data centre.

3 Key concepts and procedures

3.1 General

As part of a NABERS rating system, **Rules** provide requirements within the specific rating tools. These **Rules** apply to any building type eligible for a NABERS rating using the NABERS energy rating tools.

3.2 Eligibility criteria

A building is considered eligible for a NABERS rating if all of the following eligibility criteria are met:

a) *Building type*: During the **rating period**, the building to be rated occupies a building or part of a building that is a **data centre**.

b) *Energy or water coverage of the premises*: Minimum energy or water coverage for the rating scope and spaces included is met, as described in Chapter 4.

c) *New buildings and major refurbishments*: New builco-located ngs or buildings undertaking major refurbishments are eligible for a NABERS rating as soon as 12 months of a **rating period** can be completed. In these cases, the **rating period** can start as soon as the building begins normal operation as a **data centre**.

A NABERS **data centre** rating is based on a 28 to 40 days (approximately one month) **rating period** for IT equipment ratings or a 12-month **rating period** for **infrastructure** or **whole facility ratings**. Once certified, the rating is valid for 12 months from the certification date (the **validity period**). For further information, see Appendix A.

Table 3.2: Eligibility criteria for NABERS Energy for Data Centre ratings

Minimum criteria to qualify under NABERS	Infrastructure	IT equipment	Whole facility
Processing capacity greater than zero	✓	✓	✓
Storage capacity greater than zero	✓	✓	✓
A dedicated system for the removal of heat from the **data centre** IT equipment	✓	-	✓

Minimum criteria to qualify under NABERS	Infrastructure	IT equipment	Whole facility
Energy consumption	At least 87,600 kWh for 1 year, or with IT equipment greater than 10 kW.	At least 10,000 kWh for a 40-day period.	At least 175,000 kWh for 1 year, or with IT equipment greater than 10 kW.

While **data centres** with lower consumption can be rated, NABERS does not guarantee accuracy.

Note: Where verifying IT equipment power draw, this can be based on either a demonstration that **nameplate** consumption is greater than 30 kW, or via direct power measurement for a period of not less than one hour.

3.3 Rating period

A NABERS data centre **IT equipment rating** is based on a 28 to 40 days (approximately one month) **rating period**. A NABERS data centre **infrastructure rating** or **whole facility rating** is based on a 12-month **rating period**. Once certified, the rating is valid for a further 12 months after the **rating period** — this is called the **validity period**.

It takes time for the **Assessor** to complete a rating. Therefore 120 days is given to lodge the rating after the end of the **rating period**. Ratings lodged after the 120 days will have a reduced **validity period** to ensure all ratings are based on current **data**.

The **Assessor** must respond to all questions from the **National Administrator** within 10 working days to avoid impacting the validity of the rating.

Note: The 10 working days are included in the 120-day lodgement period.

More information on the **rating period**, **validity period** and time limits for submission can be found in Appendix A.

3.4 Standards for acceptable data and estimates

3.4.1 General

An assessment for an accredited NABERS for energy rating for **data centres** must be based on the **acceptable data** or **acceptable estimates** specified in the **Rules** (including applicable **Rulings**) or as directed by the **National Administrator**.

Data and **estimates** must be of an acceptable standard. The decision process for determining **acceptable data** and **acceptable estimates** in Sections 3.4.2 and 3.4.3 below must be followed, except where another process is specifically allowed by a provision of these **Rules**.

Note: Specific procedures related to standards for **acceptable data** and **acceptable estimates** in individual sections of these **Rules** take precedence over the standards in Section 3.4.2 and 3.4.3 below. Where specific procedures are followed, the requirement for compliance with Sections 3.4.2 and 3.4.3 is deemed to be satisfied.

3.4.2 Acceptable data

If accurate and verifiable **acceptable data** is available, it must be used. Where a section of the **Rules** allows more than one type of **data source** to be used and no particular priority is given, the following order of preference applies:

a) **Data** obtained directly by the **Assessor**.

b) **Data** provided by a third party without a significant interest in the operation or performance of the building or its equipment (such as an energy or water **utility**), including one of the following:

1) Documents or other records provided by a third party which can be verified by the **source**, e.g. **utility** bills.

2) Documents or other records which cannot be independently verified but whose authenticity and accuracy is attested to by a credible and responsible person without a conflict of interest.

3) Written information provided by a credible and responsible person, which includes their full name, position and contact details of the person giving the information.

4) Verbal information provided by a credible and responsible person, recorded in writing by the **Assessor** with the full name, position and contact details of the person giving the information.

c) **Data** provided by the owner commissioning the rating, or a third party with a significant interest in the operation or performance of the building or its equipment (such as a facility manager, technical contractor or equipment supplier), including one of the following:

1) Documents or other records provided by a party to an agreement or transaction which can be verified by another party to the same agreement or transaction, e.g. contracts or other legal agreements.

2) Documents or other records which cannot be independently verified but whose authenticity and accuracy is attested to by a credible and responsible person without a conflict of interest.

3) Verbal information provided by a credible and responsible person, recorded in writing by the **Assessor** with the full name, position, and contact details of the person giving the information.

3.4.3 Acceptable estimates

If **acceptable data** is not available, estimates (including assumptions, approximations and unvalidated **data**) can be used if they are deemed to be **acceptable estimates** in accordance with these **Rules**.

Acceptable estimates must total to no more than ± 5 % of the overall rating greenhouse gas emissions or water consumption, as calculated when using the **NABERS rating input form**. Where they are greater than 5 %, the building cannot be rated until sufficient **acceptable data** and/or **acceptable estimates** have been obtained.

3.5 Site visits

3.5.1 General

For every rating application, **Assessors** must conduct a site visit to inspect the **rated premises**. The purpose of the site visit is as follows:

a) Become familiar with the layout, services and features of the **rated premises**.

b) Confirm that documentation provided for the assessment is accurate, complete and up-to-date.

c) Check for inclusions in and exclusions from energy and water coverage (as appropriate).

d) Check floor configuration.

e) Visit plant rooms to ensure that all relevant equipment is covered under the meters included in the rating.

f) Resolve any other issues that arise.

An **Assessor's** inspection of the **rated premises** is expected to include a physical check of the servicing and metering arrangements to ensure that the energy coverage requirements of the rating are satisfied in accordance with Chapter 6.

There may be circumstances where access to all or part of the premises is refused due to safety or security concerns. If this occurs, the **Assessor** must explain why they could not access these spaces, and fully document this in the **NABERS rating input form**. Any known impacts on the quality of the information obtained for the assessment must also be fully described, e.g. an **acceptable estimate** has been used in the absence of verified **data**.

3.5.2 Delegating site visit to another Assessor

Where an **Assessor** cannot undertake a site visit to inspect the rated premises, **Assessors** may delegate this task to another **Assessor** accredited specifically for **data centres**.

The **Assessor** lodging the rating is responsible for the accuracy of the **data**. The **Assessor** must obtain and retain all the evidence required to prove their assumptions for auditing purposes, in accordance with the documentation requirements listed in Chapter 9.

3.5.3 Situations where site visit cannot be conducted or delegated

Where there are significant difficulties visiting the site, the **Assessor** cannot conduct a site visit or cannot delegate this task to another **Assessor**, guidance must be sought from the **National Administrator** prior to submission of the rating application.

3.6 Documentation and record-keeping

3.6.1 Required documentation

An assessment may be based on copies of original documents such as **utility** bills, signed leases and other records, as long as the **Assessor** is satisfied that they are, or can be verified to be, true and complete records of the original documents or files. Access to original documents is preferred if they are available. Partial copies of original documents must be sufficient to identify the original document including date, title and file name.

3.6.2 Record-keeping for auditing purposes

Assessors must keep all records on which an assessment is based.

The records kept by **Assessors** must be to such a standard that it would be possible for another **Assessor** or an **Auditor** to accurately repeat the rating using only the documents provided. This includes records of assumptions and all information and calculations used as the basis for **acceptable estimates**. The records kept must be the actual documents used for the assessment or verifiable copies. Summaries or other derivative documents that quote the original **source** documents are not acceptable, even if prepared by the **Assessor** from original documents.

Digital copies of documents are considered acceptable in all cases.

Records must be kept for 7 years from the date the rating application was lodged and be made available for audit on request.

> **Note: Assessors** remain responsible for ratings they have conducted, even if they move companies.

A list of the usual documentation for a rating is presented in Chapter 9, however, additional documentation may also be required to permit an **Auditor** to accurately repeat the rating using only the documents provided.

3.7 Alternative methodologies

Assessors may be required to use alternative methodology for obtaining or interpreting **data** for an assessment where standard methods outlined in the NABERS **Rules** cannot be applied. At a minimum, the alternative methodology must be one of the following:

a) Equivalent to the preferred method in terms of its results, accuracy and validity.

b) Acceptable in place of the preferred method, subject to the **data** resulting from the alternative method being treated as an **estimate** in accordance with Section 3.4, or other specified conditions on the use of the **data**.

c) All alternative methodologies must be approved by the **National Administrator** prior to use. For further information, please contact the **National Administrator**.

4 Processing capacity

4.1 General

In NABERS energy for **data centres IT equipment** and **whole facility ratings**, **processing capacity** is used in combination with **storage capacity** to assess the size of the IT capacity. These calculations are used to create a benchmark for energy efficiency that is appropriately customised to the **data centre**.

$$Total\ processing\ capacity\ (GHz) =$$

$$(server\ clock\ speed\ (GHz) \times number\ of\ cores)\ for\ all\ qualifying\ servers$$

Note: Processing capacity does not apply to **infrastructure ratings**.

4.2 Process overview

The process to calculate processing capacity must be in accordance with Table 4.2.

Table 4.2: Process to calculate processing capacity

Step	Task	Reference
1	Obtain inventory of all **qualifying server** equipment, including equipment identifier within the **data centre**, GHz and number of **cores**.	Section 4.3.3
2	Enter all inventory **data** into **NABERS Perform**.	N/A
3	Conduct a site inspection to verify the **qualifying server** equipment using a permitted **verification** survey methodology	Section 4.3.4
4	If it is not possible to verify an item of equipment then consider options to obtain an **acceptable estimate**.	Section 4.3.5
5	**NABERS Perform** will confirm that the **processing capacity** entered meets the NABERS **Rules**.	N/A

4.3 Assessment of processing capacity

4.3.1 General

An item of equipment is counted as a **qualifying server** if the following applies:

a) Located within the **data centre** facility.

b) Downstream of the energy metering point(s) being used for the rating.

c)   Contribute to the **processing capacity** of the facility.

d)   Not decommissioned or turned off.

Qualifying servers may include:

1)   Volume **servers**.

2)   Mid-range **servers**.

3)   High-end **servers**.

4)   Mainframes.

5)   Blade **servers**.

6)   All other **servers** not specifically excluded below.

> **Note:** Each item of **IT equipment** can contribute either to the rated **processing capacity** of the **data centre** or the rated **storage capacity**, but not both.

The following equipment are excluded from the assessment of **processing capacity**:

i)   Any **servers** or devices that are not captured in the **IT equipment** energy consumption.

ii)   Any **servers** that have been decommissioned or turned off.

4.3.2   Permitted verification survey methodologies

The **processing capacity** for a NABERS rating can be verified by one of the following:

a)   Checking all **qualifying servers**.

b)   Meeting the requirements set out in Appendix C for the site using a random sample.

> 📋 For documentation requirements, see Sections 9.2.1.1 and 9.2.2.1.

4.3.3   Verifying processing capacity of qualifying servers

The **data centre** is responsible for providing an inventory of information for each **qualifying server** that includes the following:

a)   Rack ID.

b)   Equipment manufacturer.

c)   Equipment model.

d)   **Core clock speed** (GHz).

e)   Number of **cores**.

f)   Location within the **data centre**.

The **Assessor** must verify this information. **Verification** must include the following steps:

1)   Each **qualifying server** must be identified in the **data centre** and the location recorded on a floor plan of the **data centre** in sufficient detail to enable location by a third party and ensure equipment is not double counted.

2)   Third-party written information for the **clock speed** and number of **cores** for the **server** must be obtained for each **qualifying server**. The typical **data sources** for the number of **cores** and the processor **clock speed** are as follows:

a) Third-party extractions, e.g. software extractions via Simple Network Management Protocol (SNMP).

b) Equipment documentation.

c) Equipment vendors.

d) Manual location and inspection of equipment.

3) Where adequate validated information is available, this must be used as the basis for the assessment.

4) Where adequate validated information is not available, or is ambiguous, the **Assessor** may use one of the methodologies outlined in Section 4.3.5 to calculate the **estimated processing capacity** of the **server**.

> 📋 For documentation requirements, see Sections 9.2.1.2 and 9.2.2.2.

4.3.4 Assessment documentation

The **Assessor** must provide the following documents for the assessment of **processing capacity**:

a) A list of **qualifying servers** with their **clock speeds** (GHz) and number of **cores** and location within the **data centre**.

b) A floor plan of the **data centre** identifying the location of each **qualifying server**.

c) Documentation verifying the assessment of each **server** as a **qualifying server** sufficient to meet the requirements of the **verification** survey methodology.

d) Where an estimation methodology has been used for a **qualifying server**, the estimation methodology must be recorded.

When recording the location of the **qualifying server** equipment, the location must be clear and easy to understand for a third party with limited assistance from the **data centre**.

4.3.5 Acceptable estimates

4.3.5.1 Calculation of estimates

Where it is not possible to assess the presence and/or identify the **clock speed** or number of **cores** for a **qualifying server** listed on the inventory provided by the **data centre**, the **Assessor** may **estimate** the **processing capacity** for that **server** using the following steps:

a) Where the **server** cannot be located, the **Assessor** must assume that the equipment item does not exist and therefore list it as having no **processing capacity**.

Select "Equipment not located. Assumed nonexistent" from the **validation** method dropdown menu on the **processing capacity** page within **NABERS Perform**.

b) Where no **data**, or inadequate **data** is available, the **Assessor** must assume no **processing capacity** for the identified **server**.

Select "No data. Assumed no processing power" from the **validation** method dropdown menu on the **processing capacity** page within **NABERS Perform**.

c) Where the **clock speed** and location of a **server** has been verified but the number of **cores** is unknown, the **Assessor** must assume that the number of **cores** is one, corresponding to the minimum number of **cores** in any processor.

Select "Number of cores unknown. Assumed 1 core" from the **validation** method dropdown menu on the **processing capacity page** within **NABERS Perform**.

d) Where a **server** model is known but the installed **clock speed** is not known, the lowest **clock speed** and number of **cores** for that model of **server** must be used. The **Assessor** must retain the third-party documentation that documents the lowest **clock speed** and number of **cores** for that model of **server**.

Select "Clock speed unknown. Assumed lowest for this server model" from the **validation** method dropdown menu on the **processing capacity** page within **NABERS Perform**.

The above steps to **estimate processing capacity** are acceptable when verifying all **servers** or using the **verification** survey methodology outlined in Appendix C.

4.3.5.2 Other estimates

For the four steps outlined in Section 4.3.5.1, the **estimate** of processing capacity is considered an **acceptable estimate** and does not need to be added to the **potential error** for **processing capacity**.

Unless approved by the **NABERS Administrator**, any other **estimate** of **processing capacity** is not considered an **acceptable estimate** and must be added to the **potential error** for **processing capacity**.

For other **verification** methods approved by the **NABERS Administrator**, select "No data. **Verification** method approved by NA" from the **verification** method dropdown menu on the processing capacity page within **NABERS Perform**.

For any other **estimate** that has not been approved by the **NABERS Administrator** and is not covered by the four situations outlined in Section 4.3.5.1, select "Processing capacity unknown. **Estimated** by **Assessor**. Supporting documentation required" option from **verification** method dropdown menu on the **processing capacity** page within **NABERS Perform**.

When using the **verification** survey methodology, only **acceptable estimates** of **processing capacity** can be counted towards the required number of **servers** to verify, as specified in Appendix C. Consequently, if a **server** cannot be assessed accurately or via an **acceptable estimate**, the **server** should be excluded from the **verification** survey.

4.3.5.3 Estimation documentation

Where an **estimate** of **processing capacity** has been made, the **Assessor** must provide the following information for each **qualifying server**:

a) Reason why the **estimate** had to be made.

b) Calculation of the **estimate** used, including all assumptions, approximations, supporting evidence and interpretations involved.

5 Storage capacity

5.1 General

In NABERS energy for **data centres IT equipment** and **whole facility ratings**, **storage capacity** in combination with **processing capacity** is used to assess the size of the IT capacity. These calculations are used to create a benchmark for energy efficiency that is appropriately customised to the **data centre**.

$$Total\ storage\ capacity\ (TB) =$$

$$(number\ of\ disks\ and\ tapes \times unformatted\ storage\ in\ TB)\ for\ all\ qualifying\ storage\ devices$$

Note 1: NABERS uses **unformatted storage capacity** to ensure a fair comparison between **data centres**.

Note 2: Storage capacity does not apply to **infrastructure ratings**.

5.2 Process overview

The process to calculate storage capacity must be in accordance with Table 5.2.

Table 5.2: Process to calculate storage capacity

Step	Task	Reference
1	Obtain inventory of all **qualifying server** equipment, including equipment identifier within the **data centre**, and **unformatted storage capacity** (TB).	Section 5.3.3
2	Enter all inventory **data** into **NABERS Perform**.	N/A
3	Conduct a site inspection to verify the **qualifying storage devices** using a permitted **verification** survey methodology.	Section 5.3.4
4	If it is not possible to verify an item of equipment then consider options to obtain an **acceptable estimate**.	Section 5.3.5
5	**NABERS Perform** will confirm that the **storage capacity** entered meets the NABERS **Rules**.	N/A

5.3 Assessment of storage capacity

5.3.1 General

An item of equipment is counted as a **qualifying storage device** if the following applies:

a) It is located within the **data centre** facility.

b) It is downstream of the energy metering point(s) being used for the rating.

c) It is not decommissioned or turned off.

> **Note:** As storage is integral to the operation of a **server**, an item of equipment can only be recorded as either **processing capacity** or **storage capacity**, but not both.

The following are excluded from the assessment of **storage capacity**:

1) Any **storage devices** that are not captured in the IT equipment energy consumption.

2) Any **storage devices** that have been decommissioned or turned off.

5.3.2 Permitted verification survey methodologies

The **storage capacity** for a NABERS rating can be verified by one of the following:

a) Checking all **qualifying storage devices**.

b) Meeting the requirements set out in Chapter **Error! Reference source not found.** to **estimate** the **storage capacity** for the site using a random sample.

> 📋 For documentation requirements, see Sections **Error! Reference source not found.** and **Error! Reference source not found.**.

5.3.3 Verifying storage capacity of a qualifying storage device

The **data centre** is responsible for providing an inventory of information for each **storage device** that includes the following:

a) Rack ID.

b) Equipment manufacturer.

c) Equipment model.

d) Unformatted **tape**/hard disk drive (HDD) capacity (TB).

e) Number of **tapes**/HDD.

f) Location within the **data centre**.

The **Assessor** must verify this information. **Verification** must include the following steps:

1) Each **qualifying storage device** must be identified in the **data centre** and the location recorded on a floor plan of the **data centre** in sufficient detail to enable location by a third party and ensure that equipment is not double counted.

2) Third-party written information for the **unformatted storage capacity** in TB must be obtained for each **qualifying storage device**. The typical **data sources** for this are as follows:

    a) Manual location and inspection of equipment.

    b) Equipment documentation.

    c) Equipment vendors.

    d) Third party extractions, e.g. software extractions via SNMP.

3) Where adequate validated information is available, this must be used as the basis for the assessment.

4) Where adequate validated information is not available, or is ambiguous, the **Assessor** may use one of the methodologies outlined in Section 5.3.5 for **storage capacity** to calculate the **estimated storage capacity** of the **storage device**.

> 📋 For documentation requirements, see Sections **Error! Reference source not found.** and **Error! Reference source not found.**.

5.3.4 Assessment documentation

The **Assessor** must provide the following information for the assessment of **storage capacity**:

a) A list of **qualifying storage devices** with their **unformatted storage capacity** in terabytes and location within the **data centre**.

b) A floor plan of the **data centre** identifying the location of each **qualifying storage device**.

c) Documentation validating the assessment of each **storage device** as a **qualifying storage device** sufficient to meet the requirements of the **verification** survey methodology.

d) Where an estimation methodology has been used for an equipment item, the estimation methodology must be documented.

When recording the location of the **qualifying storage device** the location must be clear and easy to understand for a third party with limited assistance from the **data centre**.

5.3.5 Acceptable estimates

5.3.5.1 Calculation of estimates

Where it is not possible to assess the presence and/or identify **storage capacity** of a **qualifying storage device**, then the **Assessor** may **estimate** the **storage capacity** of that device using the following steps:

a) Where the **storage device** cannot be located, the **Assessor** must assume that the device does not exist and therefore list it as having no **storage capacity**.

   Select "Equipment not located. Assumed nonexistent" from the **validation** method dropdown menu on the **storage capacity** page within **NABERS Perform**.

b) Where no **data**, or inadequate **data**, is available to the **Assessor** must assume no **storage capacity** for the identified **storage device**.

   Select "No data. Assumed no storage capacity" from the **validation** method dropdown menu on the **storage capacity** page within **NABERS Perform**.

c) Where the presence of drives of a given storage unit size is known but the number of drives is not known, the **Assessor** must assume that the number of drives is one, corresponding to the minimum number of drives for a single active **storage device**.

   Select "Number of drives unknown. Assumed 1 drive" from the **validation** method dropdown menu on the **storage capacity** page within **NABERS Perform**.

d) Where a **storage device** model is known but the installed **unformatted storage** is not known, the lowest available **unformatted storage** (TB) of that model of **storage device** must be used. The **Assessor** must retain the third-party documentation that documents the lowest **unformatted storage** (TB) for that model of **storage device**.

Select "Disk/tape unformatted capacity unknown. Assumed lowest for this storage model" from the **validation** method dropdown menu on the **storage capacity** page within **NABERS Perform**.

The above steps to **estimate storage capacity** are acceptable when verifying all **storage devices** or using the **verification** survey methodology outlined under Appendix C.

5.3.5.2 Other estimates

For the four steps outlined in Section 4.3.5.1, the **estimate** of **storage capacity** is considered an **acceptable estimate** and does not need to be added to the **potential error** for **storage capacity**.

Unless otherwise approved by the NABERS Administrator, any other **estimate** of **storage capacity** is not considered to be an **acceptable estimate** and is added to the **potential error** for **storage capacity**.

For other **verification** methods approved by the **NABERS Administrator**, select "No data. **Verification** method approved by NA" option from **verification** method dropdown menu on the **storage capacity** page within **NABERS Perform**.

For any other **estimate** that has not been approved by the **NABERS Administrator** and is not covered by the four steps outlined in Section 4.3.5.1, select "Disk/tape capacity unknown. Estimated by Assessor. Supporting documentation required" option from **verification** method dropdown menu on the **storage capacity** page within **NABERS Perform**.

When using the **verification** survey methodology, only **acceptable estimates** of **storage capacity** can be counted towards the required number of **servers** to verify, as described in Appendix C. Consequently, if a **storage device** cannot be assessed accurately or via an **acceptable estimate**, the **storage device** should be excluded from the **verification** survey.

5.3.5.3 Estimation documentation

Where an **estimate** of **storage capacity** has been made, the **Assessor** must provide the following information for each **qualifying storage device**:

a) Document the reason why the **estimate** had to be made.
b) Document the calculation of the estimates used, including all assumptions, **approximations**, supporting evidence and interpretations involved.

6 Energy coverage

6.1 General

Correctly interpreting the scope of energy supply and consumption **data** is essential to the accuracy of a NABERS energy for **data centre** rating. The key principles are as follows:

a) An assessment for an accredited rating must include all **sources** of external energy supplied to the rated **data centre** and must cover all of the energy **end uses** specified for the rating type.

b) **Utility** and **non-utility meters** that meet the requirements of Chapter 8 and *NABERS The Rules — Metering and Consumption* may be used in any combination to achieve the required coverage, subject to the accuracy requirements of Section 3.4.

This chapter also covers some special conditions governing inclusions and exclusions.

Metering configurations in **data centres** are complex, and the requirements for treatment of energy coverage within NABERS energy for **data centres** are also complex. **Assessors** are referred to Appendix D which illustrates the use of metering **data** for different rating types.

6.2 Infrastructure ratings

6.2.1 Requirements for energy consumption

The **infrastructure rating** includes two separate energy consumption assessments:

a) The **IT equipment** energy consumption is assessed and treated as a rating parameter that indicates the load the **infrastructure services** were serving during the **rating period**.

b) The energy consumption of the **infrastructure services** is assessed to determine the efficiency of the **data centre** in supplying **infrastructure services** during the **rating period**:

   1) For the assessment of **IT equipment** energy consumption for the **infrastructure rating**, the energy coverage is the energy supplied to all **IT equipment** that is as follows:

      a) Located within the **data centre** facility.

      b) Preferably metered at the output from the **PDUs**.

   2) For the assessment of **infrastructure services** energy consumption for the **infrastructure rating**, the energy coverage includes the following:

      a) Lighting.

      b) Air conditioning, ventilation and process cooling.

      c) In-rack fans, not including fans installed within actual **IT equipment**.

      d) Energy used in power conditioning, distribution and back-up, including **UPS** and **PDU** losses.

      e) Generator fuel where it serves infrastructure or **IT equipment** back up.

> **Note:** The **infrastructure services** energy consumption can typically be calculated as the difference between the whole facility energy consumption and the **IT equipment** energy consumption.

Infrastructure services as defined above for unused and/or vacant areas in the **data centre** must be included in the energy coverage for the **infrastructure services** energy consumption, unless subject to a permitted exclusion in accordance with these **Rules**.

6.2.2 Exclusions

Energy use may only be excluded from a NABERS rating if permitted by a provision of these **Rules** and one of the following:

a) Separately metered (or otherwise measured in the case of batch deliveries) from all energy uses to be included in the rating.

b) Quantified by an **alternative method** or measurement or estimation specified in that provision.

The following items are specifically noted as permitted exclusions, where an acceptable exclusion methodology is available:

1) **IT equipment** component: Permitted exclusions (metered and unmetered exclusions can be used as specified in these **Rules**):

    a) Energy use of **infrastructure services**.

    b) Energy from **PDU** losses from **IT equipment** metered at the input to the **PDU**.

    c) Energy of **UPS** supported equipment that is not within the **data centre**.

    d) Energy use of **PoE** equipment.

    e) Estimated small unmetered non-IT equipment end uses.

    f) Energy used for support areas such as offices, exterior lighting and car parks.

2) **Infrastructure services** component*:* Permitted exclusions (metered exclusions only can be used as specified in these **Rules**):

    a) Energy covered by the **IT equipment** component of the **infrastructure rating**.

    b) Energy and associated **UPS** and **PDU** losses associated with **UPS** supported equipment that is not within the **data centre** and where the **UPS** or **PDU** exclusively serves this equipment.

    c) Energy and associated **UPS** and **PDU** losses associated with **PoE** equipment that is not within the **data centre** and where the **UPS** or **PDU** exclusively serves this equipment.

    d) **UPS** and **PDU** energy losses associated with excludable loads that can be accurately **estimated** in accordance with Section 7.2.6.

    e) Energy used for support areas such as offices, exterior lighting and car parks.

6.2.3 Exclusion documentation

Where an exclusion of energy use has been made, the **Assessor** must keep the following information:

a) Records of each exclusion.

b)   Methodology under which it is permitted.

c)   Any associated calculations.

📋 For documentation requirements, see Section 9.4.1.1.

6.3   IT equipment ratings

6.3.1   Requirements for energy coverage

The minimum energy consumption for the **IT equipment** rating is the electricity consumed within the **data centre** to be rated during the **rating period**. This consumption will include energy supplied to all **IT equipment** that is as follows:

a)   Located within the **data centre** facility.

b)   Preferably metered at the output from the **PDUs**.

6.3.2   Exclusions

Energy use may only be excluded from a rating if permitted by a provision of these **Rules** and are separately metered from all energy uses to be included in the rating.

The following items are specifically noted as permitted exclusions, where an acceptable exclusion methodology is available:

a)   Energy use of **infrastructure services**.

b)   In-rack fans, not including fans installed within **IT equipment** items.

c)   Energy of **UPS** supported equipment that is not within the **data centre**.

d)   Energy use of **PoE** equipment.

e)   Energy used for support areas such as offices, exterior lighting and car parks.

📋 For documentation requirements, see Section 9.4.2.1.

6.4   Whole facility ratings

6.4.1   Requirements for minimum energy coverage

The minimum energy consumption for the **whole facility rating** is all energy used within the coverage of both the **infrastructure rating** and **IT equipment rating** during the **rating period**.

6.4.2   Exclusions

Energy use may only be excluded from a rating if permitted by a provision of these **Rules** and are separately metered from all energy uses to be included in the rating.

The following items are specifically noted as permitted exclusions, where an acceptable exclusion methodology is available:

a)   Energy and associated **UPS** and **PDU** losses associated with **UPS** supported equipment where:

   1)   the equipment is not within the **data centre**; and

2) the **UPS** or **PDU** exclusively serves this equipment.

b) Energy and associated **UPS** and **PDU** losses associated with **PoE** equipment where:

1) the equipment is not within the **data centre**; and

2) the **UPS** or **PDU** exclusively serves this equipment.

c) **UPS** and **PDU** energy losses associated with excludable loads that can be accurately **estimated** in accordance with Section 7.4.3.

d) Energy use of **PoE** equipment.

e) Energy used for support areas such as offices, exterior lighting and car parks.

6.5 Documentation requirements for energy coverage

The **Assessor** must obtain current single-line diagrams or electrical circuit schedules for the **source** that show the following:

a) The location and identifier (meter number) of—

1) each **non-utility meter** used for an inclusion in the rating; and

2) each **utility meter** used in the rating.

b) The location of each of the major **end uses** identified in the required energy coverage for the rating.

Where no current single-line diagram is available for a **source**, the **Assessor** must document (to the best of their knowledge), the different energy **sources** under the various meters to ensure all energy **sources** are covered in the rating assessment. The basis of this understanding must also be documented and the documentation retained as a record for audit.

> **Note:** It is recommended that single-line diagrams are updated at least once every 10 years.

> 📋 For documentation requirements, see Section 9.4.3.1.

7   Consumption data

7.1   General

This chapter should be read in conjunction with the requirements for consumption specified in *NABERS The Rules* — Metering *and Consumption*. However, there are several areas of the NABERS for **data centres** rating tool where the requirements for consumption differ significantly from other NABERS rating types, see this chapter and Chapter 8.

Where there is a conflict between these **Rules** and *NABERS The Rules* — *Metering and Consumption*, these **Rules** are to take precedence.

7.2   Measuring consumption for infrastructure ratings

7.2.1   General

As specified in Section 6.2.1, the **infrastructure rating** includes two separate energy consumption assessments:

a)   **IT equipment** energy consumption is assessed and treated as a rating parameter that indicates the load the **infrastructure services** were serving during the **rating period**.

b)   Energy consumption of the **infrastructure services** is assessed to determine the efficiency of the **data centre** in supplying **infrastructure services** during the **rating period**.

Both energy consumption assessments are conducted over a one-year **rating period**.

As the **IT equipment** energy consumption is being treated an indicator of the load on the **infrastructure services**, a false inflation of the **IT equipment** energy consumption will have an unfair positive impact on the rating result. Therefore, when making estimations or assumptions, the assessment must err on the side of assuming lower **IT equipment** energy consumption rather than higher. The **Rules** for assessing **IT equipment** energy consumption for infrastructure ratings are designed in accordance with this principle.

The infrastructure energy can be determined by calculating the difference between the whole facility energy and the **IT equipment** energy as measured for the **infrastructure rating**.

Metering configurations in **data centres** are complex and need to be well understood when used in the energy coverage requirements for NABERS energy for **data centres**. **Assessors** are referred to Appendix D for illustrations of metering **data** usage for different NABERS rating types.

7.2.2   Permitted methods for IT equipment consumption

Permitted methods for including and excluding consumption to determine **IT equipment** consumption for an **infrastructure rating** are listed in Table 7.2.2.

Table 7.2.2: Infrastructure rating (IT equipment component) —
Permitted methods to include and exclude electricity consumption

Inclusion	
Metered inclusions only	a) **Utility meters** serving the **IT equipment**.
	b) **Non-utility meters** serving the **IT equipment** that meet the requirements of Section 8.3 and/or *NABERS The Rules — Metering and Consumption*.
Exclusion	
Metered exclusions and allowable **estimates**	a) **Utility meters** serving non-**IT equipment** within the **data centre**.
	b) **Non-utility meters** serving non-**IT equipment** within the **data centre** that meet the requirements of Section 8.3 and/or *NABERS The Rules — Metering and Consumption*.
	c) **Utility meters** or **non-utility meters** serving non-**IT equipment** outside of the **data centre** as described in Section 7.2.5.
	d) **Estimated** unmetered consumption from **IT equipment** located outside of the **data centre** as described in Section 7.2.5.
	e) **Estimated** unmetered **PoE** consumption located outside of the **data centre** as described in Section 7.2.5.
	f) **Estimated** unmetered non-**IT equipment** consumption in accordance with the methods for estimating small amounts of unmetered electricity use described in *NABERS The Rules — Metering and Consumption*.
	g) **Estimated** unmetered consumption of in-rack **infrastructure services**, such as lighting or fans as described in Section 7.2.7.
	h) 3 % of total included **IT equipment** consumption measured at the input to **PDU** as described in Section 7.2.3.

7.2.3 Permitted methods for measuring infrastructure consumption

Permitted methods for including and excluding consumption to determine infrastructure consumption for an **infrastructure rating** are listed in Table 7.2.3.

Table 7.2.3: Infrastructure rating (infrastructure services component —
Permitted methods to include and exclude energy consumption

Inclusion		
Metered inclusions and allowable **estimates**	a)	**Utility meters** serving the **infrastructure services**.
	b)	**Non-utility meters** serving the **infrastructure services** that meet the requirements of Section 8.3 and/or *NABERS The Rules — Metering and Consumption*.
	c)	**Estimated** unmetered consumption of in-rack **infrastructure services**, such as lighting or fans as described in Section 7.2.7.
	d)	**Estimates** as described in *NABERS The Rules — Metering and Consumption* to calculate unmetered **infrastructure services** consumption.
	e)	Thermal energy measurements as described in *NABERS The Interim Rules — Thermal Energy Systems*.
	f)	On-site renewable energy generation as described in *NABERS The Rules — Metering and Consumption*.
	g)	Shared services or facilities consumption as specified in *NABERS Ruling — Shared Services and Facilities*.
	h)	Small **end use** estimation and batch supplies as described in *NABERS The Rules — Metering and Consumption*.
	i)	3 % of the total excluded **IT equipment** consumption measured at the input to **PDU** as described in Section 7.2.3.
Exclusion		
Metered allowable exclusions only	a)	**Utility meters** serving non-**infrastructure services** within the **data centre**.

	b) **Non-utility meters** serving non-**infrastructure services** within or outside of the **data centre** that meet the requirements of Section **Error! Reference source not found.**and/or *NABERS The Rules — Metering and Consumption*.
	c) **UPS**/**PDU** losses from metered excludable loads as described in Section 7.2.5.
	d) Thermal energy measurements as described in *NABERS The Interim Rules — Thermal Energy Systems*.
	e) On-site renewable energy generation as described in *NABERS The Rules — Metering and Consumption*.
	f) Shared services or facilities consumption as described in *NABERS Ruling — Shared services and Facilities*.

7.2.4 Treatment of PDU losses in an infrastructure rating

7.2.4.1 General

The measurement of the **IT equipment** energy within **data centres** can occur at a number of locations, including the **UPS** input; **UPS** output or **PDU** output. To ensure a consistent approach, NABERS uses *Recommendations for Measuring and Reporting Overall Data Center Efficiency, Version 2 — Measuring PUE for Data Centers,* which include four measurement categories for IT energy based on where the IT energy is measured: either at the **UPS** output (Category 1), **PDU** output (Category 2) or **IT equipment** input (Category 3).

The measurement location of the **IT equipment** energy for an **infrastructure rating** is critical as it can directly impact the final star rating.

To ensure a consistent measurement standard for NABERS **infrastructure ratings**, NABERS assumes the **IT equipment** energy is measured at the **PDU** output.

> **Note:** This NABERS assumption is equivalent to a Category 2 measurement location as defined by *Recommendations for Measuring and Reporting Overall Data Center Efficiency, Version 2 — Measuring PUE for Data Centers*.

This implies that if the meter is located at the **PDU** "output" (i.e. Metering Point A on the example below) no adjustment factor is applied. However, where the **IT equipment** energy is located between the **UPS** and **PDU** (i.e. Metering Point B on the example below), calculations are performed to adjust for the **PDU** losses. These adjustments are based on **PDU** losses being **estimated** at 3 % of the incoming energy supply to the **PDU**.

Example: IT equipment energy metering points
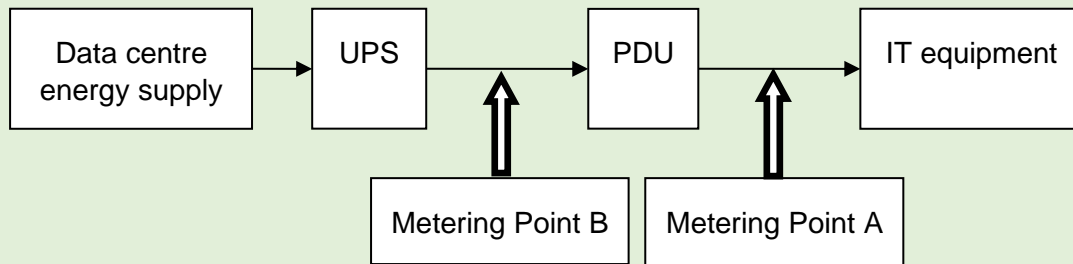
For an **infrastructure rating**, the following requirements apply:

a) *Metering* **data** *from a meter located at Metering Point A*: No adjustments are required.

b) *Metering* **data** *from a meter located at Metering Point B*: **Data** must be nominated as an "Input to PDU" in **NABERS Perform**:

1) Where **data** from Metering Point B is being *included* in the **IT equipment** component for an **infrastructure rating**, 3 % of the total consumption measured at this location is also *excluded* from the **IT equipment** consumption to account for the **PDU** losses, i.e. subtracted from the **IT equipment** consumption.

> **Note:** This is automatically calculated in **NABERS Perform**

2) Where **data** from Metering Point B is being *excluded* from the infrastructure component for an **infrastructure rating**, 3 % of the total consumption measured at this location is included in the **infrastructure services** energy as an *inclusion*.

> **Note:** This is automatically calculated in **NABERS Perform**.

The **Assessor** is not permitted to make their own calculations or estimation of **PDU** losses other than as explicitly allowed for within these **Rules**.

Using this methodology does not add to the **potential error** of the rating.

7.2.4.2 Metering documentation

The **Assessor** must ensure that the single-line diagram clearly shows the location of all metering points for which **data** is used in the rating.

7.2.5 Exclusion of IT equipment energy from equipment located outside the data centre

7.2.5.1 General

The **IT equipment** consumption component of the NABERS **infrastructure rating** can be distorted by the inclusion of energy from **IT equipment** located outside of the **data centre**. To ensure an accurate NABERS **infrastructure rating**, the **Assessor** must take the following steps:

a) If the power consumption of the equipment outside the **data centre** is metered, then this metered non-**data centre** energy must be excluded from the IT energy component of the NABERS **infrastructure rating**.

b) If the power consumption of the equipment outside the **data centre** is not metered, then all items of equipment must be identified and 12 months of energy use **estimated**.

The **estimated** energy must be calculated by assuming 24-h a day operation at 40 % of the **nameplate** rating of the equipment or at the peak measured load over a 24-h period of normal active use. The **estimated** energy use must be excluded from the **IT equipment** energy component of the NABERS **infrastructure rating**.

c)   For unmetered **PoE** systems, 12 months of energy use must be **estimated** assuming a power consumption of 50 W per port running continuously over a 24-h period.

The **estimated** energy use must be excluded from the **IT equipment** energy component of the NABERS **infrastructure rating**.

d)   For all other unmetered systems, **estimates** should be based on the methods for estimating small amounts of un-metered electricity use described in *NABERS The Rules — Metering and Consumption*.

To ensure an accurate **infrastructure rating**, the **infrastructure services** energy (e.g. air-conditioning or lighting) serving the **IT equipment** located outside of the **data centre** can only be excluded from the infrastructure consumption component where it is separately metered. **UPS** and **PDU** losses associated with the excluded **IT equipment** can be excluded from the **infrastructure services** energy consumption where it meets the requirements in accordance with Section 7.2.6.

7.2.5.2   Error treatment

If the **IT equipment** energy to be excluded is calculated according to Section 7.2.5, the excluded energy consumption is not included in the **potential error** and accuracy calculation.

7.2.5.3   Exclusion documentation

The **Assessor** must retain records of all exclusions with sufficient detail to enable reconstruction of the exclusion by a third party, including but not limited to the following:

a)   Metered **data** for exclusions and identification of meter location on the single-line diagram.

b)   A comprehensive list of equipment outside the **data centre** that is being excluded including **nameplate** wattages; or a load record **data** for 24 h verifying assessed peak plus evidence supporting the claim that this is normal use.

c)   Documentation supporting the existence and number of **PoE** ports.

> 📋 For documentation requirements, see Section 9.5.1.1.

7.2.6   Accounting for UPS/PDU losses from excludable loads in infrastructure ratings

7.2.6.1   General

Where there are excludable loads for an **infrastructure rating**, the associated **UPS** and/or **PDU** losses can be excluded, where both the following occur:

a)   The **UPS** and/or **PDU** is metered directly upstream and downstream to calculate the energy loss.

b)   The excludable load is separately metered to the **infrastructure service** loads.

Using this methodology does not add to the **potential error** of the rating.

7.2.6.2   Allowable exclusions

To calculate the allowable exclusion, the **Assessor** must complete the following:

a) Determine the ratio between the total energy supplied from the **UPS** and/or **PDU** and the excludable load consumption.

b) Apply this ratio to the measured **UPS** and/or **PDU** consumption loss to calculate the **UPS** and/or **PDU** loss from the excludable load (kWh).

c) Exclude this proportional **UPS** and/or **PDU** loss (kWh) from the rating.

If these requirements are not met, then the energy consumption from the **UPS**/**PDU** losses associated with the excludable load cannot be excluded. This methodology cannot be applied to any unmetered **estimate** of **UPS** losses or **PDU** losses.

7.2.6.3 Calculation documentation

The **Assessor** must clearly explain the calculation method used and assumptions made and retain this documentation for audit purposes.

> 📋 For documentation requirements, see Section 9.5.1.1.

7.2.7 Accounting for in-rack services in infrastructure ratings

7.2.7.1 General

If the **server** equipment racks provide services such as in-rack lighting or in-rack fans, and the energy use of these services is not metered, then the associated energy use must be **estimated**. The **estimated** energy must be excluded from the **IT equipment** consumption component and included in the **infrastructure services** consumption component of the **infrastructure rating**.

Using this methodology does not add to the **potential error** of the rating.

7.2.7.2 Determining the energy use of in-rack services

The energy use of the in-rack services is **estimated** by one of the following:

a) Assessing the full-load energy use of the in-rack services for each rack and multiplying this by 8,760 h to obtain the **estimated** annual energy use of these services during the **rating period**.

b) Monitoring the energy use of the in-rack services for a period of not less than one week and extrapolating the percentage utilisation relative to the **nameplate** wattage across the **rating period**.

7.2.7.3 Calculation documentation

The **Assessor** must retain records of the calculations undertaken with respect to this calculation, including any monitoring energy **data** and **nameplate** wattages.

> 📋 For documentation requirements, see Section 9.5.1.1.

7.2.8 Treatment of infrastructure connected to unmetered condenser water heat rejection systems for infrastructure ratings

7.2.8.1 General

For many smaller sites, the **data centre** is part of a larger office building which has a supplementary tenant condenser water loop that serves tenant supplementary air conditioning and one or more **data centres** and communications rooms throughout the site. This supplementary condenser water loop is generally operated by the building owner and its energy consumption details are not available to the **data centre** operator.

This creates a problem in assessing infrastructure and **whole facility ratings** as the heat rejection energy should be included in these ratings but cannot be due to the use of the third-party operated heat rejection system. As this is a relatively common situation, this section provides a methodology that allows a **data centre** to be assessed under NABERS.

7.2.8.2 Heat rejection systems

Heat rejection is a relatively small component of infrastructure energy. Under this methodology, **NABERS Perform** makes an adjustment based on 40 W/kW of heat rejected which is applied to the **data centre** benchmark. Where only part of the cooling plant uses the unmetered heat rejection, the correction is adjusted based on the percentage of plant capacity affected.

The **data** inputs used in this methodology also affect the calculation of the climate correction, as the climate correction is solely applied to the change in heat rejection efficiency associated with different ambient temperatures.

Where **infrastructure services** are connected to a condenser water heat rejection system that is unmetered (i.e. typically a connection to a common tenant condenser water system in a building serving other uses) then the following methodology applies:

a) If none of the **data centre** cooling equipment is attached to the unmetered heat rejection system then the **Assessor** must specify in **NABERS Perform** that 100 % of the **data centre** heat rejection system is metered (i.e. entirely metered). This would be the case for a standalone **data centre** or a **data centre** with no shared cooling services.

b) If all the **data centre** cooling equipment is attached to the unmetered heat rejection system the **Assessor** must specify in **NABERS Perform** that 0 % of the **data centre** heat rejection system is metered, i.e. entirely unmetered.

This information is used in the calculations with **NABERS Perform** to determine the standard correction for the uncaptured heat rejection energy needed to obtain the final NABERS star rating.

This approach can only be used for connections to heat rejection systems that are operated by a third party and are out of the control of the operator of the **data centre infrastructure services**.

As the adjustments are calculated within **NABERS Perform**, the **Assessor** cannot make their own adjustments or corrections to account for the heat rejection energy. The methodology above must be followed for this situation.

7.2.8.3 Estimates

If the quantity of cooling equipment that is attached to the unmetered heat rejection system is uncertain then the **Assessor** must make an **estimate** of the cooling capacity that has unmetered heat rejection energy and identify it in **NABERS Perform** as "uncertain". The **estimated** part of the heat rejection and the subsequent climate correction (which is based on total heat rejection) will be included in the **potential error** to calculate the overall rating accuracy.

7.2.8.4 Verification documentation

Where all the cooling equipment is connected to the unmetered heat rejection system (entirely unmetered) or where no cooling equipment is attached to the unmetered heat rejection system (entirely metered), all that is required is for the **Assessor** to verify this on site.

If any fraction of the cooling equipment is attached to the unmetered heat rejection system (partly metered) then the **Assessor** must create and retain a list of all cooling equipment and associated thermal capacity and heat rejection mechanisms. Any equipment for which these factors are uncertain is included in the **potential error** to calculate the overall rating accuracy.

> 📋 For documentation requirements, see Section 9.5.1.1.

7.3 Measuring consumption for IT equipment ratings

7.3.1 General

Due to the high rate of **IT equipment** change within **data centres**, the **rating period** for the **IT equipment** rating is based on approximately one month of energy consumption (electricity only) of a representative and stable period of **IT equipment** use. To measure the energy consumption, a minimum of 5 m reads must be taken to ensure an accurate measure of consumption, this includes meter readings every 7 to 10 days with one meter read on the day of the **Assessor's** site visit to verify the **processing** and **storage capacity**, see Figure 7.3.3. It is important that the meter read for all meters occurs on the same day at approximately the same time.

To validate the **processing capacity** and **storage capacity** the site visit must occur in the middle of the **IT equipment energy consumption measurement period** with a minimum of 2 weeks energy consumption collected on either side. The **IT equipment** should be stable over the **IT equipment energy consumption measurement period**, i.e. no changes to equipment or decommissioning of equipment. The variation in the daily average consumption after the site visit must be within 10 % of the daily average consumption measured before the site visit. Where the difference is greater than 10 %, the energy consumption must be collected again, see Section 8.3.3.

7.3.2 Process overview

The process to measure IT energy consumption must be in accordance with Table 7.3.2.

Table 7.3.2: Process to measure IT energy consumption

Step	Task	Reference
1	Confirm that the **IT equipment** within the **data centre** is currently stable.	Section 7.3.3

Step	Task	Reference
2	Confirm all the **IT equipment** energy consumption is covered by the meters.	Section 6.3.1
3	First meter readings for all meters supplying energy to the **IT equipment**. All readings must occur on the same day at approximately the same time. These readings can be undertaken by a person other than the **Assessor**.	Section 7.3
4	Second meter readings for all meters 7 to 10 days from the first reading. All readings must occur on the same day at approximately the same time. These readings can be undertaken by a person other than the **Assessor**.	Section 7.3.4
5	Third meter readings for all meters 7 to 10 days after the second meter reading. All readings must occur on the same day at approximately the same time. On this same day, the **Assessor** must also conduct the site visit to validate the processing capacity and **storage capacity**.	Section 7.3.4
6	Fourth meter readings for all meters 7 to 10 days after the site visit. All readings must occur on the same day at approximately the same time. These readings can be undertaken by a person other than the **Assessor**.	Section 7.3.4
7	Fifth meter reading for all meters 7 to 10 days from the fourth reading. All readings must occur on the same day at approximately the same time. These readings can be undertaken by a person other than the **Assessor**.	Section 7.3.4
8	Enter the consumption **data** into **NABERS Perform**.	N/A
9	**NABERS Perform** will check that the daily average consumption after the site inspection is within 10 % of the daily average consumption before the site visit.	Section 7.3.4

7.3.3 Confirmation of IT equipment stability and review metering arrangements

The **Assessor** must confirm with the **data centre** manager that there are no planned changes to the **IT equipment** over the **IT equipment rating period**. This includes decommissioning **servers** or the installation of new **storage devices**, etc, which may impact energy consumption.

The **Assessor** must review metering arrangements to ensure that all relevant **utility** and **non-utility meters** have been included in the assessment.

If **non-utility meters** are used in the assessment, the **Assessor** must check that all necessary **validation** (and correction of **data**, if applicable) has been carried out as specified in Section 8.3 and/or *NABERS The Rules — Metering and Consumption*. For the rating to be permitted, the total **potential error** must not exceed the limits given in Section 3.4.

> **Note:** Where a **non-utility meter** has been found to require adjustment and acceptable corrected **data** or **estimates** cannot be obtained for the relevant consumption over the entire **rating period**, then the rating cannot proceed.

7.3.4 Verification of consumption data

To verify that no significant changes to the **IT equipment** occurred when the energy consumption was collected over the **IT equipment energy consumption measurement period**, the variation in the daily average consumption after the site visit must be within 10 % of the daily average consumption measured before the site visit: see Figure 7.3.4. This is automatically checked when the consumption **data** is entered into **NABERS Perform**.

Where the energy variation before and after the site visit is more than 10 %, the **Assessor** must undertake the process again outlined in Section 7.3.2.

Figure 7.3.4: Verifying consumption data for IT equipment
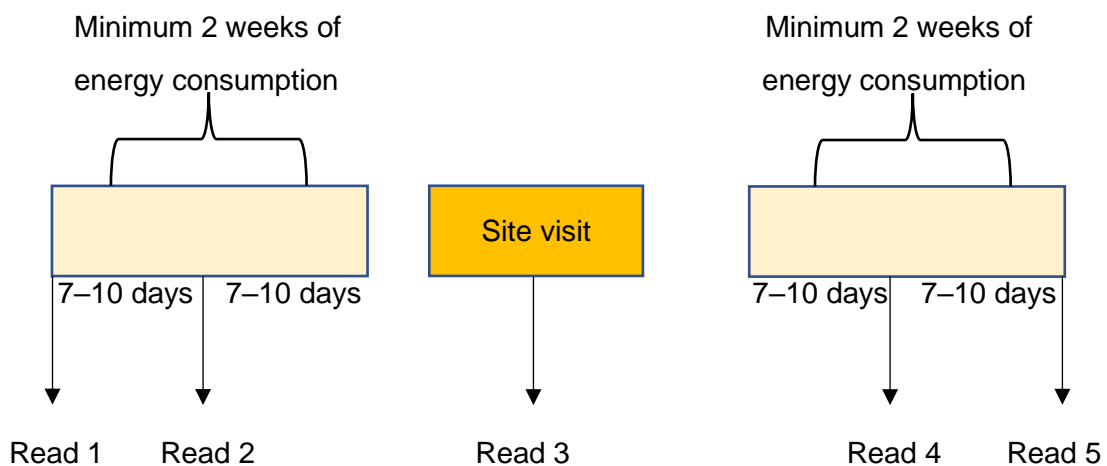
7.3.5 Permitted methods for including and excluding consumption

The **IT equipment** rating considers the electricity consumed by the **IT equipment** within the **data centre**. The **IT equipment** rating allows some **estimated** energy to be included (refer to *NABERS The Rules — Metering and Consumption*), but only metered, allowable exclusions, see Table 7.3.5. In addition, no modification is allowed for **PDU** losses based on the location of the **non-utility meter**.

Table 7.3.5: IT equipment rating — Permitted methods to include and exclude electricity consumption

Inclusion	
Metered inclusions and some allowable **estimates**	a) **Utility meters** serving the **IT equipment**.

	b) **Non-utility meters** serving the **IT equipment** that meet the requirements of Section 6.3 and/or *NABERS The Rules — Metering and Consumption*. c) **Estimates** as described in *NABERS The Rules — Metering and Consumption* to calculate unmetered **IT equipment** consumption.
Exclusion	
Metered exclusions only	a) **Utility meters** serving non-**IT equipment** within the **data centre**. b) **Non-utility meters** serving non-**IT equipment** within the **data centre** that meet the requirements of Section 6.3 and/or *NABERS The Rules — Metering and Consumption*. c) **Utility meters** or **non-utility meters** serving non-**IT equipment** outside of the **data centre** that meet the requirements of Section 6.3 and/or *NABERS The Rules — Metering and Consumption*.

7.3.6 Using utility bills to determine consumption

Utility bills may only be used for **IT equipment** ratings if each of the following conditions are satisfied:

a) The NABERS **IT equipment** rating process to measure the energy consumption must be in accordance with Section 7.3.1. Therefore, the **Assessor** must obtain daily readings from the **utility** provider for the relevant meters to cover a complete and continuous one month period, i.e. 28 to 40 days.

b) The **utility** bills that account for the consumption of a NABERS energy **IT equipment** rating must cover the entire **rating period**. No displacement from the **rating period** is allowed.

c) There is no allowance for adjustment of missing or **estimated utility** bills for a NABERS energy **IT equipment** rating. Where **utility data** is used for an **IT equipment** rating the **data** must not be missing or **estimated**.

> **Note:** The allowances for missing or estimated utility **metering system data** of *NABERS The Rules — Metering and Consumption* do not apply to NABERS energy for **data centres IT equipment** ratings.

📋 For documentation requirements, see Section 9.5.2.1.

7.4 Measuring consumption for whole facility ratings

7.4.1 General

The **whole facility rating** is conducted over a one-year **rating period**.

The whole facility energy is the sum of all **IT equipment** and infrastructure energy and is typically measured at the incoming supply.

7.4.2 Permitted methods to include and exclude consumption

All energy used within the coverage of the infrastructure and **IT equipment** ratings during the **rating period**.

No modification is allowed for **PDU** losses based on the location of the meter as the rating is based on the total **data centre** energy consumption.

Permitted methods for including and excluding consumption to determine energy consumption for a **whole facility rating** are listed in Table 7.4.2.

Table 7.4.2: Whole facility rating — Permitted methods to include and exclude energy consumption

Inclusion	
Metered inclusions and some allowable **estimates**	a) **Utility meters** serving the **data centre**.
	b) **Non-utility meters** serving the **data centre** that meet the requirements of Section 6.3 and/or *NABERS The Rules — Metering and Consumption*.
	c) **Estimates** as described in *NABERS The Rules — Metering and Consumption* to calculate unmetered **infrastructure services** consumption.
	d) Thermal energy measurements as described in *NABERS The Interim Rules — Thermal Energy Systems*.
	e) On-site renewable energy generation as described in *NABERS The Rules — Metering and Consumption*.
	f) Shared services or facilities consumption as described in *NABERS Ruling — Shared Services and Facilities*.
	g) Small **end use** estimation and batch supplies as described in *NABERS The Rules — Metering and Consumption*.

Exclusion	
Metered exclusions only	a) **Utility meters** serving non-**data centre** loads within the **data centre**.
	b) **Non-utility meters** serving non-**data centre** loads within the **data centre** that meet the requirements of Section 6.3 and/or *NABERS The Rules — Metering and Consumption*.
	c) **Utility meters** or **non-utility meters** serving non-**data centre** loads located outside of the **data centre**.
	d) **UPS/PDU** losses from metered excludable non-**data centre** loads as described in Section 7.4.3.
	e) Thermal energy measurements as described in *NABERS The Rules — Thermal Energy Systems*.
	f) On-site renewable energy generation as described in *NABERS The Rules — Metering and Consumption*.
	g) Shared services or facilities consumption as described in *NABERS Ruling — Shared Services and Facilities*.

7.4.3 Accounting for UPS/PDU losses from excludable loads

The same **Rules** in relation to **infrastructure ratings** also apply to **whole facility ratings**, see further details in Section 7.2.6.

7.4.4 Treatment of infrastructure connected to unmetered condenser water heat rejection systems for whole facility ratings

The same **Rules** in relation to **infrastructure ratings** also apply to **whole facility ratings**, see further details in Section 7.2.8.

📋 For documentation requirements, see Section 9.5.3.1.

8 Metering systems

8.1 General

This section should be read in conjunction with the requirements for metering specified in *NABERS The Rules — Metering and Consumption*. However, there are several areas of the NABERS **data centres** rating tool where the requirements for metering differ significantly from other NABERS rating types, see this chapter and Chapter 7.

Where there is a conflict between these **Rules** and *NABERS The Rules — Metering and Consumption*, these **Rules** are to take precedence.

8.2 Non-utility meter records — Minimum frequency of readings for IT equipment ratings

All **non-utility meters** used to provide **data** for energy consumption inclusions or exclusions must have a record of readings that is at least one meter read every 7 to 10 days for **IT equipment** ratings.

The **Assessor** must document the readings and the documentation retained as a record for audit.

All other NABERS **data centre** requirements for **non-utility meter** records will be in accordance with *NABERS The Rules — Metering and Consumption*.

> 📋 For documentation requirements, see Sections 9.6.1.1, 9.6.2.1 and 9.6.3.1.

8.3 Non-utility metering system validation

8.3.1 General

The requirements of **non-utility metering system validation** in *NABERS The Rules — Metering and Consumption* are applicable to NABERS for **data centres** ratings. However, special additional allowances are made for **data centre** ratings in recognition of the complexity and volume of the **non-utility metering systems** they typically feature. The special additional allowances are intended to reduce the burden of **non-utility metering system validation** on **data centre** operators, without compromising the integrity of **data** for the NABERS rating. The special additional allowances are detailed in these **Rules** and should also be read in conjunction with *NABERS The Rules — Metering and Consumption*.

8.3.2 Using an energy balance for validation

8.3.2.1 Acceptable alternative method

An energy balance may be used as an **alternative method** for **non-utility metering system validation**. Application of this method is an acceptable alternative to the methodologies prescribed for validating current transformer (CT) electricity meters and remote meter reading systems in *NABERS The Rules — Metering and Consumption*.

The energy balance methodology can be applied to any discrete configuration of meters that includes a parent meter with two or more child meters where together, the child meters capture all energy consumption downstream of the parent meter.

Under the energy balance methodology, all child meters in each discrete configuration are considered to be validated under the following circumstances:

a)   The sum of consumption recorded on the child meters is within +/-5 % of the consumption recorded on the parent meter for a time period of at least 7 days.

b)   The parent meter should be one of the following:

1)   A **utility metering system**.

2)   A **non-utility metering system** that does not require **validation** under *NABERS The Rules — Metering and Consumption*.

3)   A **non-utility metering system** that has been validated in accordance with *NABERS The Rules — Metering and Consumption*.

4)   A **non-utility metering system** that has been validated as a child meter within an upstream metering configuration via this energy balance methodology.

If the above requirements are not met, the child meters cannot be considered validated and the meter **validation** methodology prescribed in *NABERS The Rules — Metering and Consumption* should be applied. The requirements of *NABERS The Rules — Metering and Consumption* apply to any metering faults that are identified via the energy balance methodology.

8.3.2.2   Discrepancies in energy balance readings

The following process is recommended in the event that the sum of the consumption recorded on the child meters fails to balance within +/-5 % of the consumption recorded on the parent meter:

a)   Review the metering configuration to ensure that the parent/child network is configured as expected and that the consumption ought to balance.

b)   Review the meter **data** and point references within the **RMRS** to ensure that the correct meters are being used to conduct the energy balance calculation.

If the above are checked and there is still a discrepancy in the energy balance, then this is indicative of one or metering errors in the field. The field of meters should be systematically checked to isolate and rectify the error(s).

8.3.2.3   Other requirements for validation via an energy balance system

Remote meter reading systems can only be validated via the energy balance methodology if the **data** used to perform the energy balance is obtained via the remote meter reading system.

Virtual meters cannot be used either as parent meters nor child meters in application of the energy balance methodology.

> **Note:** Refer to *NABERS The Rules — Metering and Consumption* for a definition and discussion of virtual meters.

Multiple energy balances can be conducted to validate cascading series of parent/child metering configurations. In each case, each independent energy balance should be conducted and documented as per the energy balance methodology.

The energy balance methodology can be performed by the NABERS **Assessor** or any other competent person.

For each **non-utility metering system** that is successfully validated via the energy balance methodology, **Assessors** should enter the type of **validation** required into **NABERS Perform** in accordance with the **non-utility metering system** type (i.e. CT meter and/or **RMRS**) and enter the result of the **validation** as successful.

8.3.3   Energy balance methodology documentation

8.3.3.1   General

For each application of the energy balance methodology, the **Assessor** must obtain the following:

a)   Single-line diagram(s) that clearly identifies the parent meter and each child meter to be used in the energy balance. The diagram(s) will verify that the aggregated child meter consumption ought to balance with the parent meter consumption by showing the following:

1)   There is no consumption downstream of the parent meter that is not captured by the child meters.

2)   There is no consumption via the child meters that is not supplied via the parent meter.

b)   Records of consumption **data** on each meter that meet the requirements of *NABERS The Rules — Metering and Consumption*.

c)   Records of calculations to demonstrate that the sum of consumption recorded on the child meters is within +/-5 % of the consumption recorded on the parent meter for a time period of at least 7 days.

d)   A dated statement identifying which child meters are validated via energy balance with which parent meter.

8.3.3.2   Verification and updating of single-line diagrams

The requirements for the frequency of meter **validation** in *NABERS The Rules — Metering and Consumption* are also applicable to NABERS for **data centres** ratings. In addition, **Assessors** are required to obtain **verification** of the accuracy of any single-line diagrams that are greater than 10 years old if the diagrams are to be used as evidence for a NABERS for **data centres** rating.

> **Note:** It is recommended that the manager of the **data centre** should have all single-line diagrams verified and updated at least every 10 years.

8.3.4   Adjustments from validation checks

NABERS The Rules — Metering and Consumption specifies how an **Assessor** shall account for adjustments required to **non-utility metering systems** as a result of **validation** checks. Those requirements apply to NABERS energy for **data centre** ratings with the following exception.

In the case of assessing **IT equipment** energy consumption for an **infrastructure rating**, where it is not possible to calculate the correct values from incorrect **metering system data**, the following may occur:

a)   *Data relating to inclusions*: The rating can proceed if the consumption is not included in the rated **IT equipment** energy consumption, only metered inclusions are allowed.

b) ***Data*** *relating to exclusions*: The energy must be accounted for via another means allowable under Section 7.2.1.

For documentation requirements, see Sections 9.6.1.2, 9.6.2.2 and 9.6.3.2.

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9 Documentation requirements for accredited ratings

9.1 General

The **Assessor** must keep all records on which an assessment is based, including any specific guidance or approvals given by the **National Administrator**. **Data** retained for audit must be in a form which facilitates reviews and makes anomalies easily apparent.

Access to original documents is preferred if they are available. Copies of original documents may be used as evidence as long as the **Assessor** is satisfied that they are, or can be verified to be, true and complete records of the original documents or files.

Information may be contained in many different formats. The purpose of the documentation is to provide an acceptable, credible **source** of the required information. In some instances, specific document types may be unnecessary for an individual rating. However, under different rating circumstances, the specific document types may carry multiple items of information required for the rating. The qualifying factor is not the type of document but that the documentation contains the required information in an acceptable format.

The information in Sections 9.2 to 9.6 is required for a rating. It is organised based on the divisions of previous chapters, see Chapters 4 to 8. All the required information should be obtained from the **data centre** owner/manager of the premises before a site visit, and then confirmed during the site visit and subsequent assessment. An on-site inspection helps to verify that the information provided is accurate, current and complete.

This chapter covers most of the documentation required for infrastructure, **IT equipment** and **whole facility ratings**. Individual ratings may require additional information or documentation depending on the individual circumstances of the **rated premises**.

Documentation requirements from *NABERS The Rules — Metering and Consumption* apply in addition to those set out below.

9.2 Chapter 4: Processing capacity

9.2.1 NABERS IT equipment rating

Topic	Requirements	Documentation
9.2.1.1 Assessment of processing capacity	Section 4.3	For each **qualifying server**: a) **Verification** documentation for GHz and **core data** or associated **estimates**. b) Verified location and one of the following:

Topic	Requirements	Documentation
		1) Verified GHz and number of **cores**. 2) Documentation of **estimated** GHz and number of **cores** and selected estimation methodology.
9.2.1.2 Verifying process capacity of qualifying servers	Section 4.3.3	Listing of all **server** equipment for each **qualifying server**, including the following: a) **Server** rack ID. b) Equipment manufacturer. c) Equipment model. d) **Core clock speed** (GHz). e) Number of **cores**. f) Location within the **data centre**.

9.2.2 NABERS whole facility rating

Topic	Requirements	Documentation

9.2.2.1 Assessment of processing capacity	Section 4.3	For each **qualifying server**:
		a) **Verification** documentation for GHz and **core data** or associated **estimates**.
		b) Verified location and one of the following:
		
		   1) Verified GHz and number of **cores**.
		
		   2) Documentation of **estimated** GHz and number of **cores** and selected estimation methodology.

9.2.2.2 Verifying process capacity of qualifying servers	Section 4.3.4	Listing of all **server** equipment for each **qualifying server**, including the following: a) **Server** rack ID. b) Equipment manufacturer. c) Equipment model. d) **Core clock speed** (GHz). e) Number of **cores**. f) Location within the **data centre**.

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9.3 Chapter 5: Storage capacity

9.3.1 NABERS IT equipment rating

Topic	Requirements	Documentation

9.3.1.1 Assessment of storage capacity	Section 5.3	For each verified **qualifying storage device**:
		a) **Verification** documentation for total **unformatted storage** or associated **estimate**.
		b) Verified location and one of the following:
		   1) Verified **storage capacity**.
		   2) Identification of **estimated storage capacity** and selected estimation methodology.

9.3.1.2 Acceptable data	Section 5.3.5	Listing of all **data** storage equipment, with unformatted terabytes, for each **qualifying storage device** including the following: a) Rack ID. b) Equipment manufacturer. c) Equipment model. d) Number of **tapes**/HDD. e) Location within the **data centre**.

9.3.2 NABERS whole facility rating

Topic	Requirements	Documentation

9.3.2.1 Assessment of storage capacity	Section 5.3	For each verified **qualifying storage** device:
		a) **Verification** documentation for total **unformatted storage** or associated **estimate**.
		b) Verified location and one of the following:
		   1) Verified **storage capacity**.
		   2) Identification of **estimated storage capacity** and selected estimation methodology.

9.3.2.2 Acceptable data	Section 5.3.5	Listing of all **data** storage equipment, with unformatted terabytes, for each **qualifying storage device** including the following: a) Rack ID. b) Equipment manufacturer. c) Equipment model. d) Number of **tapes**/HDD. e) Location within the **data centre**.

9.4   Chapter 6: Energy coverage

9.4.1   NABERS infrastructure rating

Topic	Requirements	Documentation
9.4.1.1 Infrastructure ratings	Section 6.2	Single-line diagram indicating distribution of energy within the site and the coverage of each distribution board in terms of the required energy **end uses** for the rating being performed, including the location in relation to the **UPS** and **PDUs**. Clear indication of the location of meters used to define the rating.

9.4.2   NABERS IT equipment rating

Topic	Requirements	Documentation
9.4.2.1 IT equipment ratings	Section 6.3	Single-line diagram indicating distribution of energy within the site and the coverage of each distribution board in terms of the required energy **end uses** for the rating being performed, including the location in relation to the **UPS** and **PDUs**. Clear indication of the location of meters used to define the rating.

9.4.3   NABERS whole facility rating

Topic	Requirements	Documentation
9.4.3.1 Whole facility ratings	Section 6.4	Single-line diagram indicating distribution of energy within the site and the coverage of each distribution board in terms of the required energy **end uses** for the rating being performed, including the location in relation to the **UPS** and **PDUs**. Clear indication of the location of meters used to define the rating.

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9.5 Chapter 7: Consumption data

9.5.1 NABERS infrastructure rating

Topic	Requirements	Documentation
9.5.1.1 Measuring consumption for infrastructure ratings	Section 7.2.5	Documentation covering calculated **IT equipment** energy **estimates**, including a list of equipment and **nameplate** ratings or a copy of the 24 h energy record used to calculate the exclusion.
		Note: This is for the **IT equipment** component of the **infrastructure rating** only.
	Section 7.2.6	Documentation of the calculation method used to account for **UPS**/**PDU** losses from metered excludable loads.
	Section 7.2.7	Documentation of any **estimates** of energy use of in-rack services that are not included within the metered infrastructure energy.
	Section 7.2.8	Documentation of the cooling capacity of all cooling system equipment, if part (but not all) of this equipment has unmetered heat rejection.

9.5.2 NABERS IT equipment rating

Topic	Requirements	Documentation
9.5.2.1 Measuring consumption for IT equipment ratings	Section 7.3	Daily **utility** and/or validated **non-utility metering data**, covering approximately one month (28 to 40 days) of energy consumption for the **rating period**.

9.5.3 NABERS whole facility rating

Topic	Requirements	Documentation
9.5.3.1 Treatment of infrastructure connected to unmetered condenser water heat rejection systems	Section 7.4.4	Documentation of the cooling capacity of all cooling system equipment, if part (but not all) of this equipment has unmetered heat rejection.

9.6 Chapter 8: Metering systems

9.6.1 NABERS infrastructure rating

Topic	Requirements	Documentation
9.6.1.1 Non-utility meter records	Section 8.2 and *NABERS The Rules — Metering and Consumption*	Evidence of records of readings of **non-utility meters**.
9.6.1.2 Non-utility metering system validation	Section 8.3 and *NABERS The Rules — Metering and Consumption*	Evidence of accuracy and **validation** of **non-utility meters**, with particular reference to Section 8.3.3.

9.6.2 NABERS IT equipment rating

Topic	Requirements	Documentation
9.6.2.1 Non-utility meter records	Section 8.2 and *NABERS The Rules — Metering and Consumption*	Evidence of records of readings of **non-utility meters**.
9.6.2.2 Non-utility metering system validation	Section 8.3 and *NABERS The Rules — Metering and Consumption*	Evidence of accuracy and **validation** of **non-utility meters**, with particular reference to Section 8.3.3.

9.6.3 NABERS whole facility rating

Topic	Requirements	Documentation
9.6.3.1 Non-utility meter records	Section 8.2 and *NABERS The Rules — Metering and Consumption*	Evidence of records of readings of **non-utility meters**.
9.6.3.2 Non-utility metering system validation	Section 8.3 and *NABERS The Rules — Metering and Consumption*	Evidence of accuracy and **validation** of **non-utility meters**, with particular reference to Section 8.3.3.

Appendix A   Rating period

A.1   Allowance for lodgement

A.1.1   General

A NABERS **data centre** rating is based on 28 to 40 days (approximately one month) of **acceptable data** for **IT equipment** ratings and 12 months of **acceptable data** for infrastructure and **whole facility ratings**, called the **rating period**. Once certified, the rating is valid for up to 12 months, called the **validity period**.

It can take time for an **Assessor** to complete a rating. Therefore, a period of 120 calendar days is given to lodge the rating after the end of the **rating period**. Ratings lodged after the 120 calendar days will have a reduced **validity period** to ensure all ratings are based on current **data**.

Sections A.1.2 and A.1.3 provide examples of this principle.

A.1.2   Scenario 1

A NABERS rating is lodged with the **National Administrator** within 120 calendar days of the end of the **rating period**. It will be valid for 365 days from the date of certification, see Error! Reference source not found..2.

> **Example:** The process for date of certification will be as follows:
>
> a)   The **rating period** is 1 January 2022 to 31 December 2022. The due date is therefore 30 April 2023.
>
> b)   The **Assessor** lodges the rating on 1 February 2023, and the **National Administrator** certifies it on 5 February 2023. This is before the due date.
>
> c)   The rating will therefore be valid for 365 days from the date of certification (5 February 2023).

Figure A.1.2: Rating lodged within 120 days of end of rating period
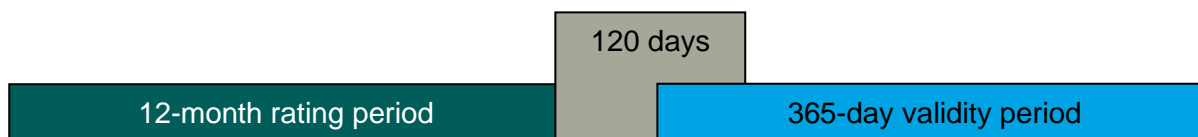

A.1.3   Scenario 2

A NABERS rating is lodged with the **National Administrator** more than 120 calendar days after the end of the **rating period**. It will be valid for 365 days from the end of the **rating period**, see **Error! Reference source not found.**.

> **Example:** The process for date of certification will be as follows:

a) The **rating period** is 1 January 2022 to 31 December 2022. The due date is therefore 30 April 2023.

b) The **Assessor** lodges the rating on 1 June 2023, and the **National Administrator** certifies it on 6 June 2023. This is after the due date.

c) The rating will therefore be valid for 365 days from the end of the **rating period** (31 December 2022).

d) It will expire on 31 December 2023.

Figure A.1.3: Rating lodged after 120 days from end of rating period
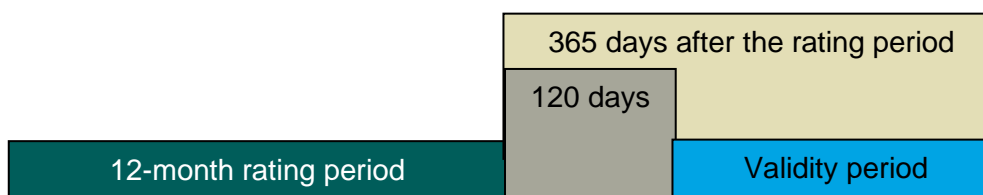
A.2   Allowance for responses

A.2.1   General

The **Assessor** is given 120 days after the **rating period** to lodge ratings with the **National Administrator**. The **Assessor** should allow 10 working days within this 120-day period for a response from the **National Administrator**. The **National Administrator** then allows a further 10 working days for the **Assessor** to respond to any queries that arise from quality assurance checks before certification.

When the **Assessor** is required to provide clarification multiple times, this must be done within the allowable 10 working days period.

If the **Assessor** has not responded adequately to all queries and the rating has not been certified within 120 days of the end of the **rating period** + 10 working days, the rating will only be valid for up to 365 days from the end of the **rating period**. This does not include the time taken by the **National Administrator**.

Section A.1.2 provides an example of this principle.

A.2.2   Scenario

A NABERS rating is lodged with the **National Administrator** one day before the lodgement due date (120 days from the end of the **rating period**). Depending on how quickly the **Assessor** responds to clarifications, the rating will either be valid for 365 days from the date of certification or 365 days from the end of the **rating period**.

Example: The process for date of certification will be as follows:

a) The **rating period** is 1 January 2022 to 31 December 2022. The due date is therefore 30 April 2018.

b) The **Assessor** lodges the rating on 29 April 2023, 119 days after the end of the **rating period**.

> c) The **National Administrator** responds on 3 May 2023 requesting further clarification. The **Assessor** must provide adequate clarification by 14 May 2023 (120 days from the end of the **rating period** plus 10 working days) for the rating to be valid for 365 days from the date of certification.
>
> d) If the **Assessor** responds on the 8 May 2023, the rating will be certified and valid until the 8 May 2024.
>
> e) If the **Assessor** does not respond with clarification until the 30 May 2023, the rating will only be valid until 365 days from the end of the **rating period** and therefore will expire on the 31 December 2023.

A.3   Adjusting the rating period

After the rating has been lodged, the **Assessor** may require the **rating period** to be changed. The **rating period** may only be adjusted by a maximum of 62 days from the first lodgement. A new rating will need to be created if the **Assessor** would like to adjust the **rating period** by more than this initial timeframe.

Note: A rating is required to comply with the **Rules** that are current at the time of lodgement. **Assessors** are advised to seek advice and request a **Ruling** (if needed) prior to lodging ratings that may require one.

Requests to adjust the **rating period** for an **IT equipment** rating after lodgement will be considered by the **National Administrator** on a case-by-case basis.

A.4   Lodging successive ratings

A.4.1 General

For a building which already has a current rating, there are two options to complete another rating of the same type, i.e. replace or renew.

Note: The **Assessor** will be prompted to select "replace" or "renew" when creating a rating. This selection can be changed just before the rating is lodged but not after.

A.4.2 Option 1: Replace

The replace option allows the new certified rating to replace the existing rating immediately upon certification.

There will be loss of the existing rating's remaining **validity period**. This option may be chosen if the new rating is better than the existing rating, see **Error! Reference source not found.**.2.

Figure A.4.2: Existing rating replaced by a new rating

A.4.3 Option 2: Renew

The renew option allows the new certified rating to begin its **validity period** immediately after the existing rating **validity period** expires. This option is often chosen when a site is most concerned with maximising the **validity period**.

As ratings are based on current **data**, the new **validity period** cannot not exceed 485 days from the end of the **rating period**. To ensure the new rating maximum **validity period** is achieved, the **validity period** must start within 120 days after the end of the **rating period**.

Section A.4.4 provides an example of this principle.

A.4.4 Scenario 1

A NABERS rating is lodged with the **National Administrator** and the renew option has been selected. The new rating begins its **validity period** within 120 days after the end of the **rating period**, see **Error! Reference source not found.**.4.

Example: The process for date of certification will be as follows:

a)   The current rating's **validity period** expired 31 December 2022.

b)   The **rating period** is 1 October 2021 to 30 September 2022 for the renewal rating.

c)   The **Assessor** lodges the renewal 1 November 2022 and it is certified by the **National Administrator** 7 November 2022.

d)   The **validity period** for the renewal will be 1 January 2023 to 31 December 2023.

Figure A.4.4: Validity period for new rating begins once old rating expires and new validity period is 365 days

12-month rating period	485 days after the rating period	
	Old 365-day validity period	New 365-day validity period
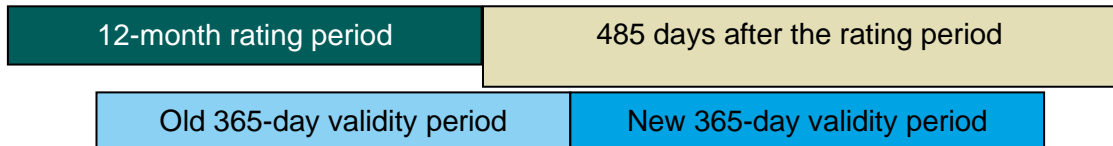
If the new rating's **validity period** begins more than 120 days after the end of the **rating period**, the validity will be reduced as the **validity period** will exceed 485 days from the end of the **rating period**.

Note: An expired rating can be renewed. The **validity period** will begin on the date of certification, rather than the date the previous rating expired.

Section A.4.5 provides an example of this principle.

A.4.5 Scenario 2

A NABERS rating is lodged with the **National Administrator** and the renew option has been selected. The new rating begins its **validity period** over 120 calendar days after the end of the **rating period**, see **Error! Reference source not found.**.

Example: The process for date of certification will be as follows:

a)   The current rating's **validity period** expired 31 December 2022.

b) The **rating period** is 1 August 2021 to 31 July 2022 for the renewal rating.

c) The **Assessor** lodges the renewal 1 November 2022 and it is certified by the **National Administrator** 7 November 2022.

d) The **validity period** for the renewal will be 1 January 2023 to 28 November 2023, 485 days after the end of the **rating period**.

Figure A.4.5: Validity period for new rating begins once old rating expires and new validity period is less than 365 days

12-month rating period	485 days after the rating period	
	Old 365-day validity period	New validity period
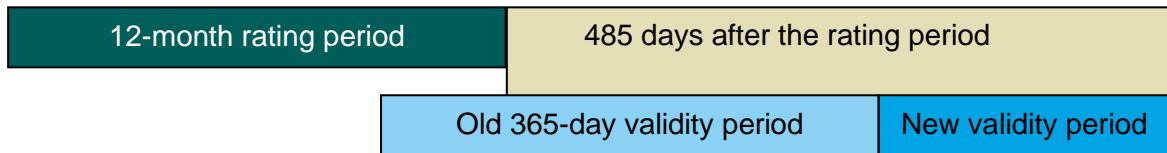
Appendix B   Calculations

B.1   General

This appendix provides calculations for **verification** and accuracy required for NABERS rating assessments.

B.2   Sampling uncertainty for verification surveys

Analyse the sample **data** to determine an **estimate** of the **verification** ratio and **capacity variable**, as follows:

a)   Calculate the **verification** ratio (x) for each item of equipment.

b)   Calculate the sample mean **verification** ratio (X) (average of the **capacity variable** over all equipment sampled so far)

c)   Calculate the sample standard deviation (S) of the **verification** ratio figures (x) using the formula:

$$S = \sqrt{\frac{\sum_j[(x_j - X)^2 c_j]}{c}}$$

where:

X = total validated **capacity variable** divided by total inventory **capacity variable**

c_j = the verified capacity of the jth equipment

j = the number of equipment items to date

$$c = \sum_j c_j$$

d)   Calculate the sampling uncertainty (U) in the equipment you have sampled, as follows:

$$U = 0.44S\sqrt{\frac{C}{c-1}}$$

where:

C = the total **capacity variable** from the inventory

If $U \geq 0.0.5X$, then the sampling uncertainty is 5 % or more, and the sample is too small. Take the equipment item from the list, assess the **capacity variable**, add this **data** to the **data** already collected, and repeat the estimation of the sampling uncertainty. Repeat adding **data** for additional equipment items while $U \geq 0.05X$.

When $U < 0.05X$, the statistical uncertainty in the figure is now less than 5 %, and the figure can be used. If more **data** than essential is collected, it is better to use the extra **data** to improve the uncertainty.

Multiply the sample mean (X) by the total inventory **capacity variable** (C) to obtain the validated **capacity variable** for use in the rating.

B.3   Accuracy calculation procedure

B.3.1   General

NABERS Perform includes sections for calculating the error that could result if inaccurate assumptions, approximations, or unverified **data** are used in a NABERS rating assessment. It is important that this "worst-case" error is known and is kept within limits so that NABERS ratings can be relied upon for comparison.

B.3.2   Potential error — Processing capacity, storage capacity and energy consumption

For all rating parameters the **potential error** is the total of all **estimates** (including assumptions, approximations and unverified **data**) used in place of **acceptable data** for that rating parameter. **NABERS Perform** automatically calculates the **potential error** for each rating assessment.

B.3.3   Total rating accuracy

The combined effect of all **estimates** (including assumptions, approximations and unverified **data**) on a rating is calculated within **NABERS Perform** by comparing two ratings ("Case A" and "Case B") to ensure the results differ by no more than 5%. The steps for this calculation are as follows:

a)   Calculate a "Case A" rating using all the (including assumptions, approximations and unverified **data**) intended to be used in the assessment.

b)   Calculate the **potential error** for each rating parameter.

c)   *Infrastructure ratings*: Calculate a "Case B" rating in which the **potential errors** are as follows:

    1)   *Energy consumption of infrastructure*: Subtract from the "Case A" inputs.

    2)   Energy consumption of **IT equipment**: Add to the "Case A" inputs.

d)   *IT equipment and whole facility ratings*: Calculate a "Case B" rating in which the **potential errors** are one of the following:

    1)   Processing capacity and storage capacity: Add to the "Case A" inputs.

    2)   *Energy consumption data*: Subtract from the "Case A" inputs.

e)   The "Case A" rating meets the accuracy requirements of this section if the results from the calculations for the "Case A" and "Case B" ratings differ by no more than 5 %.

Appendix C   Verification survey methodology

C.1   General

The survey methodology described in this chapter is permitted as a process for the **verification** of either **processing capacity** or **storage capacity** of any **data centre**.

C.2   Using survey methodology

C.2.1 General

As the methodology for either **processing capacity** or **storage capacity** is essentially the same, these are each generically referred to as "**capacity variable**" for the purposes of this chapter. The purpose of the methodology is to establish the accuracy of the **capacity variable data** provided by the **data centre**. As such it is reliant on the **data centre** providing an inventory of processing and storage equipment.

The underlying calculations for this process are described in Section B.2.

C.2.2 Methodology process

The methodology process is as follows:

a)   Enter all the claimed **capacity variable data** for all **data centre** equipment into **NABERS Perform**.

b)   Reference the instructions column in **NABERS Perform** to sort the equipment by capacity. This identifies the largest **servers**/**storage devices** to assist in targeting the racks with the largest capacity.

> **Note: Verification** in descending order of **capacity variable** is recommended as this will minimise the total amount of equipment that has to be verified.

c)   Sequentially, in the sorted order, identify the actual equipment item in the field and validate the claimed equipment **capacity variable** following the **acceptable estimate** procedures outlined in Sections 4.3 and 5.3.

   Estimates that are not **acceptable estimates** under these **Rules** cannot be used in the **verification** methodology survey.

d)   Enter the validated capacity **data** into **NABERS Perform**, which will evaluate the average ratio of the claimed to validated capacity (also known as the "**verification** ratio") and the associated statistical uncertainty in the **verification** ratio.

e)   A minimum of 20 items, or 50 % (by **capacity variable**) of the qualifying equipment in the **data centre** (whichever is the lesser) must be validated.

f)   The final figure for the **capacity variable** for use in the rating is the product of the claimed capacity and the **estimated verification** ratio. This is calculated automatically by **NABERS Perform**.

C.2.3 Standard for acceptable data

The statistical uncertainty for the figure resulting from the survey, as calculated above, must be less than 5 %. This is confirmed by **NABERS Perform**.

Use of **NABERS Perform** so that the survey complies with the statistical methodology above is deemed to satisfy the accuracy requirements of these **Rules**.

Appendix D   Metering examples

D.1   General

Energy metering in **data centres** is complex. In this chapter, examples are provided to illustrate the possible metering set-ups within **data centres** and how the energy should be attributed for an **infrastructure**, **IT equipment** and **whole facility rating**.

Within the **data centre** metering arrangement, the power is assigned into three basic categories:

a) *Non-essential supply into the **data centre***: This supplies loads that are not backed up by the **UPS** equipment.

b) *Essential supply to the **data centre***: This supplies loads that are backed up by the **UPS** equipment.

c) *Services supply into the **data centre***: This supplies the lighting, air conditioning and miscellaneous power within the **data centre**.

Not all **data centres** are set up like this, but the intention of the following sections is to provide examples of how common metering configurations should be assessed under NABERS for the **infrastructure**, **IT equipment** and **whole facility ratings**.

D.2   Infrastructure rating

D.2.1   General

The **infrastructure rating** assesses two separate energy consumption figures, the infrastructure energy consumption (see Figure D.2.2.1) and the **IT equipment** energy consumption, see Figure D.2.3.3.

In determining the **IT equipment** energy consumption for an **infrastructure rating**, NABERS permits some excludable loads to be estimated and adjusts for **PDU** losses so to ensure that the **IT equipment** energy is not over-represented, as over-representation would have a false positive impact on the rating result.

D.2.2   IT equipment component

D.2.2.1   Basic configuration

In a typical metering configuration, all **IT equipment** is separately metered with no excludable loads downstream from the meters, i.e. **IT equipment** metering points are those highlighted in green in Figure D.2.2.1.

In Figure D.2.2.1 the metering locations to measure the energy consumption for the **IT equipment** component of the **infrastructure rating** are as follows:

a) Figure D.2.2.1 Metering Point 7, which measures the consumption of rack level **IT equipment** not supported by the **UPS**.

b) Figure D.2.2.1 Metering Point 9, which measures the rack level **IT equipment** consumption supported by the UPS.

Both points are separately metered and do not support any excludable equipment downstream of the meters, see Figure D.2.2.1. If both metering points are available, no further metering is required for the **IT equipment** component of the **infrastructure rating**.

NABERS

Figure D.2.2.1: IT component for NABERS infrastructure rating

Site energy supply

E0: Data centre supply

Non-data centre supply
e.g. office lighting, power and HVAC

Non-UPS PDU for IT equipment

E1a: Input to PDU

E1b: Output from PDU

UPS for IT equipment

E2a: Input to UPS

E2b: Output from UPS (ONLY)

E3: Other data centre infrastructure
e.g. lighting, security and HVAC

PDU serving excluding loads only

X **E4a:** Input to PDU

X **E4b:** Output from PDU

PDU serving IT equipment

E5a: Input to PDU

E5b: Output from PDU

Key

Consumption required — preferred metering locations

Allowable metering locations

X Allowable exclusions (metered or allowable estimates)

3 % adjustment for PDU losses applied

Metering locations not required

E7: Rack level assessable IT equipment

(not supported by UPS)

X **E11:** Infrastructure loads

X **E14:** Non-data centre loads

X **E8:** Excludable loads

E9: Rack level IT loads

(supported by UPS)

X **E12:** Rack level infrastructure loads

X **E15:** Non-data centre loads

E6: Data centre lighting and miscellaneous

E10: Air conditioning and heat rejection dedicated to data centre

E13: Metered heat rejection used by data centre
e.g. shared services

E16: Metered heat rejection not used by data centre

D.2.2.2 Constructing energy consumption from metered inclusions and metered/estimated exclusions

The method to assess the **IT equipment** consumption for an **infrastructure rating** requires an under-estimate of **IT equipment** energy to be included where adequate metering is not available.

Where the **data centre** does not directly measure the **IT equipment** energy at Metering points E7 and E9 in Figure D.2.2.1, NABERS allows limited alternative locations for measuring **IT equipment** energy.

Example 1: Where **IT equipment** energy is measured at the output from the **UPS** (Metering Point E2b in Figure D.2.2.1) the following apply:

a) If the energy to be included is being measured at the output from the **UPS** (Metering Point E2b), the meter must be recorded as being located at the "input to PDU" within **NABERS Perform**. **NABERS Perform** will apply the necessary adjustments for **PDU** losses according to Section 7.2.4.

b) The energy consumption from excludable loads (Metering Points E4a/E4b and D8), **infrastructure services** (Metering Point E12) and non-**data centre** loads (Metering Point E15) must be excluded as follows:

   1) If it is metered, exclude the metered consumption.

   2) Otherwise, estimate the consumption according to the requirements specified in Section 7.2.1.

Example 2: Where **IT equipment** energy is measured at the non-**UPS** supported **PDU** (Metering Point E1a or Metering Point E1b in Figure D.2.2.1) the following apply:

a) If the energy to be included is being measured at the input to the **PDU** (Metering Point E1a), the meter must be recorded as being located at the "input to PDU" within **NABERS Perform**. **NABERS Perform** will apply the necessary adjustments for **PDU** losses according to Section 7.2.4.

b) If the energy to be included is being measured at the output from the **PDU** (Metering Point E1b), the meter must be recorded as being located at the "output from PDU" within **NABERS Perform**. This is the ideal metering location (see Section 7.2.3) and no adjustment for **PDU** losses is required.

c) The energy consumption from **infrastructure services** (Metering Point E11) and non-**data centre** loads (Metering Point E14) must be excluded. If it is metered, exclude the metered consumption. Otherwise, estimate the consumption according to the requirements specified in Section 7.2.1.

Example 3: Where **IT equipment** energy is measured at the **UPS** supported **PDU** (see Metering Point E5a or Metering Point E5b in Figure D.2.2.1) the following apply:

a) If the energy to be included is being measured at the input to the **PDU** (Metering Point E5a), the meter must be recorded as being located at the "input to PDU" within **NABERS Perform**. **NABERS Perform** will apply the necessary adjustments for **PDU** losses according to Section 7.2.3.

b) If the energy to be included is being measured at the output from the **PDU** (Metering Point E5b), the meter must be recorded as being located at the "output from PDU" within **NABERS Perform**. This is the ideal metering location (see Section 7.2.3), and no adjustment for **PDU** losses is required.

c) The energy consumption from **infrastructure services** (Metering Point E12) and non-**data centre** loads (Metering Point E15) must be excluded. If it is metered, exclude the metered consumption. Otherwise, estimate the consumption according to the requirements specified in Section 7.2.1.

Example 4: Where the **IT equipment** energy is measured at the input to a **UPS** that supports one or more **PDUs** (Metering Point E2a in Figure D.2.2.1) without sub-metering at Metering Point E2b or Metering Point E9, the NABERS **infrastructure rating** cannot proceed.

Note: Where sufficient metering exists, the **UPS** and **PDU** losses associated with excludable non-**data centre** loads may be estimated accurately according to Section 7.2.5 and then excluded from the rating. This applies to both the **IT equipment** component and the **infrastructure services** component for the NABERS **infrastructure rating**.

D.2.3 Infrastructure services component

D.2.3.1 General

There are a number of ways to accurately calculate the **infrastructure services** energy, depending on the metering set-up in the **data centre**. Two scenarios are provided in Sections D.2.3.2 and D.2.3.3.

D.2.3.2 Infrastructure services separately metered

Where the **infrastructure services** are separately metered (Metering Points E6, E10, E11, E12, E13, **PDU** loss across E1a/E1b, **UPS** loss across E2a and E2b, **PDU** loss across E4a/E4b and E5a/E5b in Figure D.2.3.3) and the consumption does not include any excludable loads, either because there no excludable loads downstream from the meters, or the excludable loads are separately metered, this consumption can be used.

D.2.3.3 Calculating infrastructure service energy from the difference between the metered whole facility and IT equipment consumption

D.2.3.3.1 General

In this situation, the infrastructure energy consumption is calculated from the difference between the metered **whole facility** consumption and the **IT equipment energy consumption** and any allowable exclusions, e.g. non-**data centre** loads.

To calculate the **IT equipment** consumption to be used to derive the **infrastructure services** consumption, only metered exclusions are allowed.

D.2.3.3.2   Step 1: Calculate whole facility load

Where the **data centre** energy is measured at the point of supply to the whole **data centre**, in this example at Metering Point E0 (Figure D.2.3.3) or as the sum of the energy immediately downstream of the whole site supply (Metering Points E1a, E2a and E3), no further metering to record consumption is required to calculate the **whole facility** load. NABERS does not allow energy to be measured at Metering Point E1b or Metering Point E2b.

D.2.3.3.3   Step 2: Calculate infrastructure services consumption

To calculate the **infrastructure services** consumption, metered non-infrastructure loads may be excluded from the **whole facility** consumption, see Figure D.2.3.3. In this example, the following can be excluded through metering:

a)   **IT equipment** loads, measured at Metering Points E7 and E9.

b)   Non-**data centre** loads, measured at Metering Points E4a, E4b, E8, E14 and E15.

c)   Loads external to the **data centre**, measured at Metering Point E16.

d)   Metered **UPS** and **PDU** losses associated with excludable non-**data centre** equipment; calculated proportionally in accordance with Section 7.2.5.

For example, to calculate the infrastructure energy according to Figure D.2.3.3, the equation is as follows:

$$\textit{Infrastructure energy} = \textit{Whole data centre energy} - \textit{IT equipment energy} - \textit{Non-data centre exclusions}$$

This would be calculated using the metering points as follows:

$$\textit{Infrastructure energy} = E0 - (E7 + E9) - (E4a + E14 + E15 + E16)$$

Whenever the **IT equipment** energy deduction is measured at the "Input to PDU", then 3 % of the consumption measured at this point is added to the infrastructure energy component of the rating.

Example: If the IT energy is measured at Metering Point E1a (and excluded from the whole **data centre** energy to calculate the infrastructure energy), then 3 % of this consumption should be added to the infrastructure energy to account for **PDU** losses.

This is automatically calculated within **NABERS Perform**.

Figure D.2.3.3: Infrastructure services for NABERS infrastructure rating
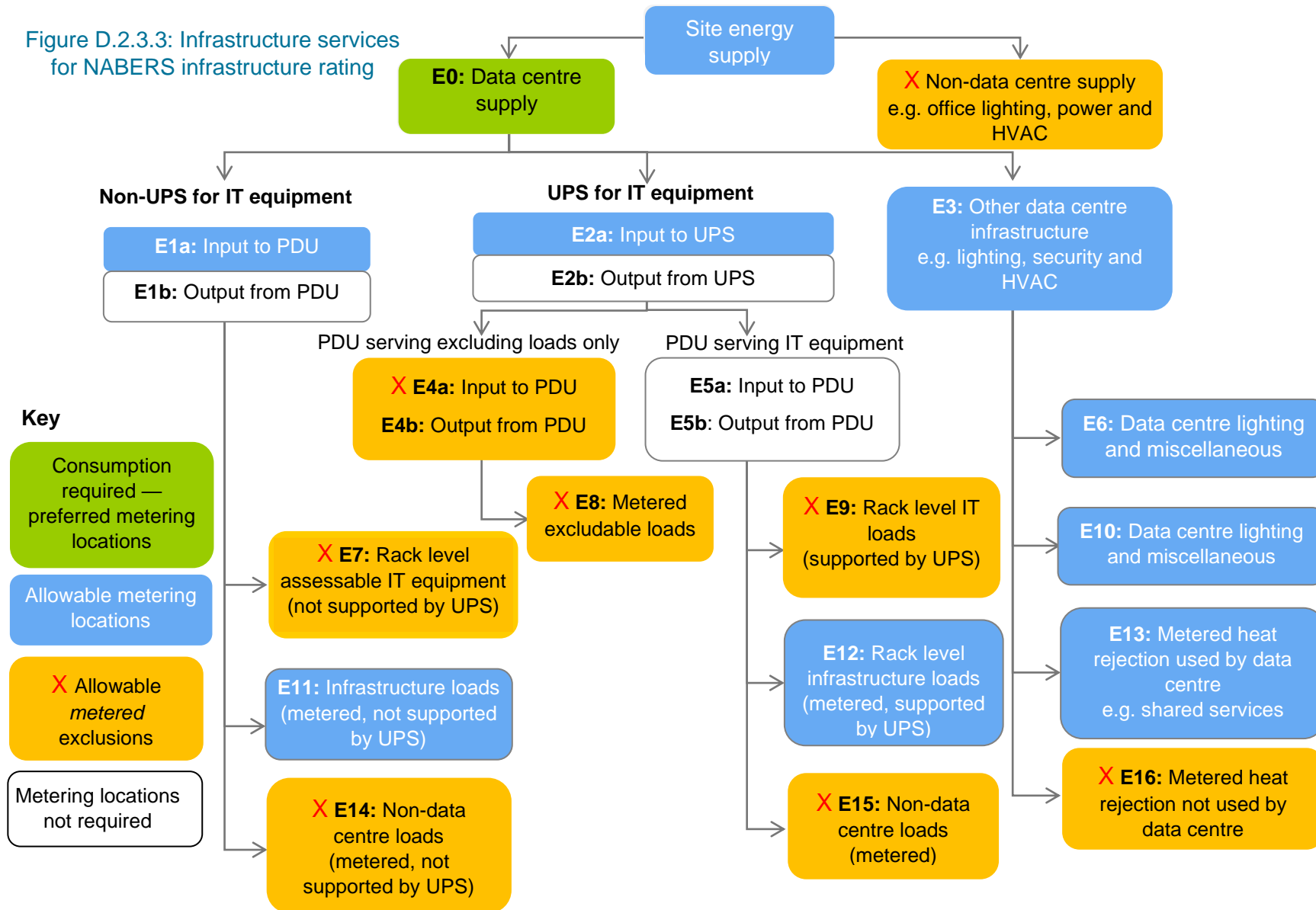
D.3   IT equipment rating

D.3.1 General

A NABERS **IT equipment** rating includes the energy consumption of all **servers**, **storage devices**, networking equipment, and any other **IT equipment** within the **data centre**. Importantly, any non-**IT equipment** energy consumption exclusions must be separately metered, and no adjustments are made for **UPS**/**PDU** losses.

D.3.2 Basic configuration (no exclusions necessary)

In a typical set-up, all **IT equipment** is separately metered with no excludable loads downstream from the meters. In Figure D.3.2, the metering locations to measure the energy consumption for a NABERS **IT equipment** rating are as follows:

a)   Metering Point E7, which measures the consumption of rack level **IT equipment** not supported by the **UPS**.

b)   Metering Point E9, which measures the rack level **IT equipment** consumption supported by the **UPS**.

Both points are separately metered and do not support any excludable equipment downstream of the meters. If both metering points are available, no further metering is required for the **IT equipment** rating.

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Figure D.3.2: IT equipment for NABERS rating

Site energy supply

E0: Data centre supply

Non-data centre supply e.g. office lighting, power and HVAC)

Non-UPS for IT equipment

UPS for IT equipment

X **E3:** Other data centre infrastructure e.g. lighting, security and HVAC

E1a: Input to PDU

E1b: Output from PDU

E2a: Input to UPS

E2b: Output from UPS

X **E4a:** Input to PDU

E4b: Output from PDU

E5a: Input to PDU

E5b: Output from PDU

Key

Consumption required — preferred metering locations

Allowable metering locations

X Allowable metered exclusions

E7: Rack level assessable IT equipment (not supported by UPS)

X **E8:** Metered excludable loads

E9: Rack level IT loads (supported by UPS)

X **E6:** Data centre lighting and miscellaneous

X **E10:** Air conditioning and heat rejection dedicated to data centre

X **E11:** Infrastructure loads

X **E12:** Rack level infrastructure loads

X **E13:** Metered heat rejection used by data centre e.g. shared services

X **E14:** Non-data centre loads

X **E15:** Non-data centre loads

X **E16:** Metered heat rejection not used by data centre

D.4   Whole facility rating

D.4.1 General

The **whole facility rating** is a combination of both the **IT equipment** and **infrastructure ratings** and is primarily designed for **data centres** that do not have adequate metering to undertake separate ratings.

The energy consumption for the NABERS **whole facility rating** is the entire consumption for the whole **data centre** minus any metered excludable loads, such as non-**data centre** office spaces, external lighting etc. Consequently, only metered energy data can be excluded in a **whole facility rating**, see Figure D.4.3. No adjustment for **PDU** losses is allowed for a **whole facility rating**.

### D.4.2 Basic configuration (no exclusions necessary)

Ideally the energy consumption for a **whole facility rating** is covered by a single point of supply to the **data centre**, Metering Point E0 in this example, or equivalent to the sum of the metered consumption immediately downstream of the site energy supply, e.g. the sum of Metering Points E1a, E2a and E3 in Figure D.4.3.

NABERS does not allow energy to be measured at Metering Point E1b or Metering Point E2b for a **whole facility rating**.

D.4.3 Constructing energy consumption from metered inclusions and metered exclusions

If Metering Point E0, or the sum of Metering Points E1a, E2a and E3, supply some non-**data centre** loads, these can be excluded where they are separately metered, see Figure D.4.3. No adjustment to compensate for **UPS**/**PDU** losses is allowed under NABERS for a **whole facility rating**.

Figure D.4.3: Whole facility for NABERS rating
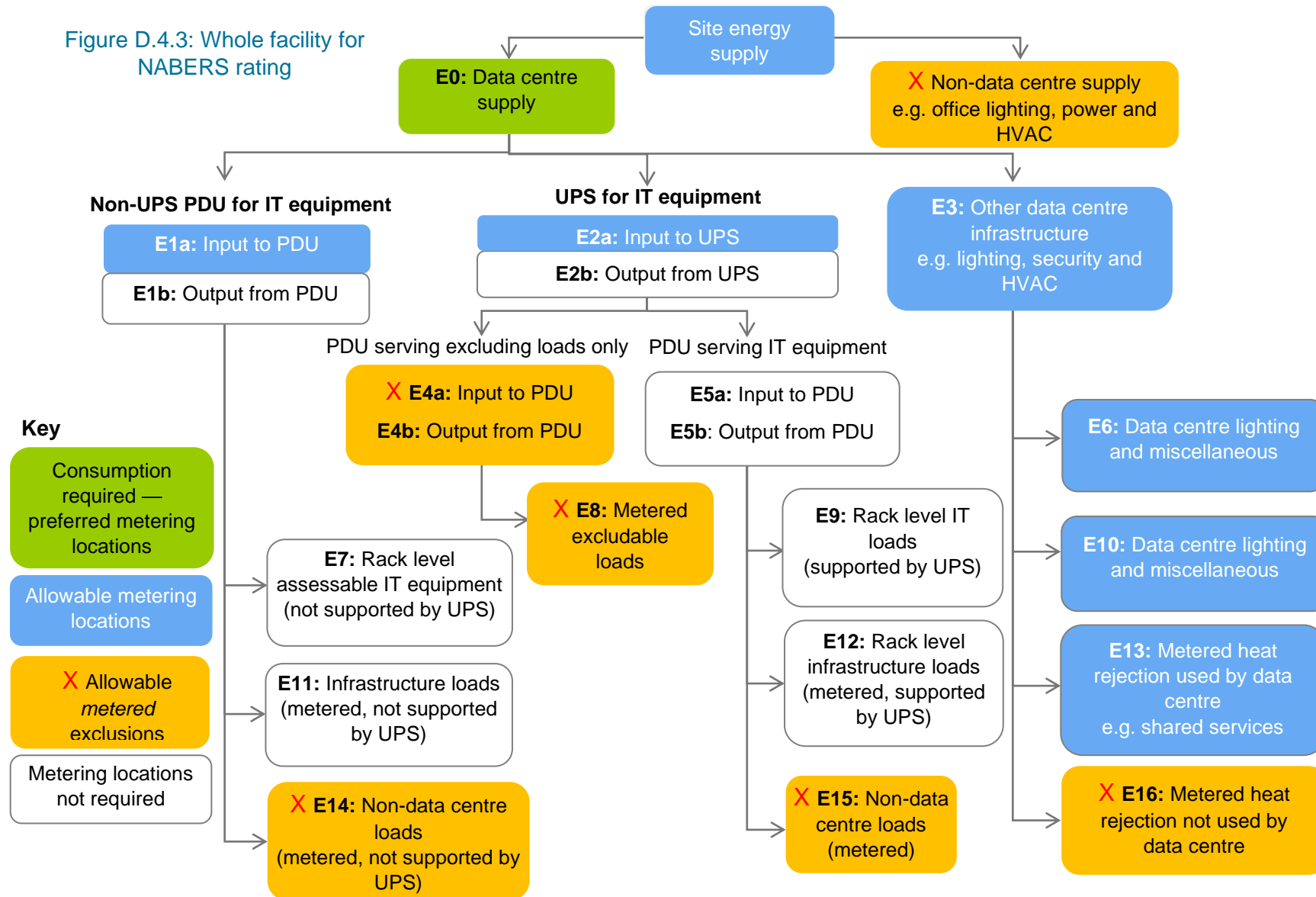
Appendix E   List of changes

NABERS The Rules — Energy for data centres, v2.0 contains major structural changes from previous versions of the **Rules**, as follows:

a) The template has been updated for ease of navigation and consistency across all NABERS **Rules**. This means that most chapter numbers have changed or been re-ordered.

b) Assessors should refer to *NABERS The Rules — Metering and Consumption* for requirements relating to metering and consumption.

c) All definitions have been moved from the beginning of each chapter to a single "Terms and definitions" chapter (see Chapter 2). Some definitions have been updated for consistency across all NABERS **Rules**, or removed because they are no longer used in this document.

The nature and scale of these updates means it is not practicable nor desirable, to record each individual change in this appendix. Instead, the following table lists the changes to the content of *NABERS Energy for data centres — Rules for collecting and using data*, v1.1, 2014 in order to produce these current **Rules**, *NABERS The Rules — Energy for data centres*, v2.0.

 If you have any questions or concerns, please contact the **National Administrator**.

Overview		
Version 1.1 (superseded)	**Version 2.0 (current)**	**Content changes**
Document location		
NABERS document title: *NABERS Energy for data centres — Rules for collecting and using data*	NABERS document title: *NABERS The Rules — Energy for data centres*	Title amended in accordance with NABERS style guide.
Chapter 1 Introduction	Chapter 1 Introduction	Air-conditioning has been specifically included in the scope of infrastructure ratings.
Chapter 1 Introduction	Chapter 2 Terms and definitions	All document definitions are now consolidated into this one chapter.
Chapter 2 Key concepts	Chapter 3 Key concepts and procedures	Net Internal Area need not be assessed as it is not relevant to data centres. Added alternative methods section and process overview section.
		Note: All following chapters have been renumbered accordingly.

Overview		
Version 1.1 (superseded)	**Version 2.0 (current)**	**Content changes**
Chapter 3 Processing capacity	Chapter 4 Processing capacity	No change.
Chapter 4 Storage capacity	Chapter 5 Storage capacity	No change.
Chapter 5 Energy storage	Chapter 6 Energy storage	The on-site generation and Green Power sections have been removed from the current version. **Assessors** must now refer to *NABERS The Rules — Metering and Consumption* for guidance.
Chapter 6 Metering systems	Chapter 7 Consumption data	Order of chapter rearranged to align with *NABERS The Rules — Metering and Consumption*.
Chapter 7 Consumption data	Chapter 8 Metering systems	Order of chapter rearranged to align with *NABERS The Rules — Metering and Consumption*.
N/A	Appendix A	New appendix has been added in accordance with NABERS templates.
Appendix B	Appendix B	No change.
Appendix C	N/A	This information is now covered in *NABERS The Rules — Metering and Consumption*.
Appendix D	Appendix C	Renumbered due to removal of Appendix C (v1.1).
Appendix E	Appendix D	Renumbered due to removal of Appendix C (v1.1).
N/A	Appendix E	New appendix has been added in accordance with NABERS templates.

Contact us

**NABERS administered by the
New South Wales Government**

4 Parramatta Square

12 Darcy Street

Parramatta NSW 2150

T (02) 9995 5000

E nabers@environment.nsw.gov.au

W nabers.gov.au